TEST REPORT

INDUSTRIAL TOWEL LAUNDRY FACILITY EMISSIONS TEST

Test Site

G&K Services, Inc.
324 Taylor Street
Manchester, NH 03103

Prepared for

G&K Services, Inc.
Minnetonka, MN

Prepared by

TRC
Windsor, CT

July 2009

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James Canora

TRC Project No. 166052
July 2009

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EXECUTIVE SUMMARY

TRC Environmental Corporation of Windsor, Connecticut ("TRC") was retained by G&K Services, Inc. ("G&K") to perform emissions testing at the G&K industrial towel laundering facility located at 324 Taylor Street (garment plant) and 341 Taylor Street (towel plant) in Manchester, New Hampshire (collectively, the "Facility"). The testing was conducted in accordance with the final Test Protocol (the "Protocol") submitted to the U.S. Environmental Protection Agency ("EPA") and the New Hampshire Department of Environmental Services ("NHDES") on May 22, 2009. Bill Osbahr of the EPA verbally approved the Protocol during the stack test.

The test objective was to develop emission factors for both volatile organic compounds ("VOC"), as defined in 40 CFR 51.100(s) and New Hampshire Rule Env-A 101.211, and Federal organic hazardous air pollutants ("HAP"), as identified in Section 112(b) of the Clean Air Act, on the basis of pounds of emissions per 1000 pounds of soiled towels processed (i.e., sorted, weighed, laundered, and dried). The emission factors are used to calculate annual emissions for comparison to Federal and State regulatory applicability thresholds. In addition to regulated VOC and HAP emissions, this test report also evaluates emissions of Regulated Toxic Air Pollutants ("RTAP") which are identified in Env-A 1450.01 and regulated under Chapter Env-A 1400.

Testing was conducted on May 13, 2009 during shop towel laundering and on May 14, 2009 during print towel laundering. Measurements were conducted at four locations: the dryer exhaust; the hot water heater exhaust; the temporary equalization tanks ("EQ Tanks") exhaust; and the temporary Towel Wash Room exhaust. Total VOC emission concentrations were measured in accordance with EPA Methods 25 and 25A. Method 25A was used to measure emissions semi-continuously over the entire duration of the tests from all four emission points and EPA Method 25 was used to determine a response factor for Method 25A. Individual HAP and RTAP emissions were measured in accordance with EPA Method TO-15.

The tests were conducted with several modifications to the Protocol under the direction of Mr. Bill Osbahr, EPA Region I Environmental Engineer. Modifications included the addition of measurements at the dryer stack and the hot water heater stack when the devices were not operating. Accordingly, the dryer off and hot water heater off data was included in the emissions calculations for both shop and print towels. Modifications also included testing at the Towel Wash Room and EQ Tank exhausts for extended periods of time after the laundering processes were completed on the print towel day. The extended period monitoring was conducted until VOC emission concentrations returned to pre-test levels and the corresponding data was included in the emission factor calculation. In addition, only five loads of print towels were processed during the test period rather than six loads, as specified in the Protocol.

Table E-1 presents a summary of total annual VOC and HAP emissions from the towel plant based on this test program and historical operations data. Annual shop and print towel throughputs are estimated for calendar years 2003 to 2008, consistent with the timeframe set forth in the Clean Air Act Testing Order and Reporting Requirement, dated December 30, 2008. Please note that G&K's initial response to the Clean Air Act Testing Order and Reporting Requirement did not include certain data for the calendar years 2003 to 2005. Since G&K's submittal of its initial response, however, G&K has located additional documents concerning the Facility's operations during 2003, 2004, and 2005 and has included that information in this report. Further, the 2006 to 2008 data for the pounds of soiled towels received and processed was based on the number of clean towels delivered to customers multiplied by a soil weight factor, as set forth in the response to question 4.c.i. of the Clean Air Act Testing Order and Reporting Requirement. For purposes of calculating emissions from processing shop and print towels, however, this report utilizes the weight of towels that are laundered, which is a more appropriate basis for calculation. Appendix G provides data on the historical amount of towels laundered.

Annual actual VOC and HAP emissions from the towel plant, in conjunction with actual emissions from fuel combustion devices at the garment plant (less than 0.5 tons per year VOC/HAP), are less than the US EPA major source thresholds. Major source thresholds applicable to the Manchester facility are 50 tons per year (tpy) of VOC, 10 tpy of a single HAP, and 25 tpy of combined HAPs. By comparison, the highest historical annual emissions between 2003 and 2008 from the towel plant are less than half of these thresholds: 23.8 tpy VOC, 1.4 tpy single HAP, and 2.5 tpy combined HAPs.

Actual VOC emissions from the towel plant are greater than the 10 tons per year threshold under New Hampshire's air permitting program at Env-A 607.01(g). Therefore, a temporary permit and permit to operate is required for equipment at the towel plant. Accordingly, G&K is submitting to the NHDES, concurrently with this test report, a State air quality permit application with corresponding air permit fees.

Tables E-2 and E-3 present VOC and HAP emissions test data for shop and print towels, respectively. Emission factors for VOC and federal HAPs are presented in pounds of emissions per 1000 pounds of soiled towels processed.

Table E-4 summarizes the comparison of measured RTAP emissions from the towel plant to the *de minimis* thresholds and, where necessary, 50% of the ambient air limits (AAL) to demonstrate that the towel plant is exempt from the requirements in Chapter Env-A 1400 pursuant to Env-A 1402.01(c). In summary, 23 RTAPs were measured above detection levels. Daily and annual actual emissions of these RTAPs were compared to the corresponding *de minimis* thresholds. Actual emissions of all but three RTAPs are *de minimis*. For the remaining three RTAP: m,p-xylene; 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene, G&K calculated the adjusted in-stack concentration using the method prescribed in Env-A 1405-05 and compared these values to the 50% AAL thresholds. The adjusted in-stack concentration of all three RTAPs are less than 50% of the AAL; therefore, RTAP emissions from the towel plant are exempt from the requirements of Chapter Env-A 1400.

Table E-1
Summary of Annual VOC and Federal HAP Emissions (Tons per Year) - Towel Plant
G&K Services, Inc.

	2003	2004	2005	2006	2007	2008
Shop Towel VOC	3.2	2.5	2.8	2.9	3.0	4.3
Printer Towel VOC	12.4	13.6	15.4	13.9	16.4	19.5
Shop Towel HAP	0.35	0.27	0.31	0.31	0.33	0.47
Printer Towel HAP	1.3	1.4	1.6	1.5	1.7	2.1
TOTAL VOC	**15.5**	**16.1**	**18.3**	**16.8**	**19.4**	**23.8**
TOTAL HAP	**1.7**	**1.7**	**1.9**	**1.8**	**2.1**	**2.5**

Table E-2
Shop Towels Emission Factors
G&K Services, Inc. - May 13, 2009

Source	Emission Period Start Time	Emission Period Stop Time	Emission Period Duration (hours)	Soiled Towel Weight (lbs)	Average TOC (ppmC)	Exhaust Flow Rate (scfm)	Average VOC (lb/hour)	Total VOC Emitted During Test Period (lb)	VOC Emission Factor (lb/1000lb)	EPA TO-15 Total HAPs (lb/hour)	Total HAP Emitted During Test Period (lb)	HAP Emission Factor (lb/1000lb)
Towel Wash Room	8:30	18:32	10.03	6660	178	4802	1.60	16.02	2.41	0.41	4.11	0.62
EQ Tanks	8:30	18:32	10.03	6660	420	292	0.24	2.36	0.354	0.03	0.30	0.045
Dryer (On)	8:30	18:32	6.27	6660	568	6357	7.03	44.0	6.61	0.36	2.26	0.34
Hot Water Heater (On)	8:30	18:32	3.27	6660	2.16	954	0.0039	0.0126	0.002	0.0010	0.003	0.0005
Dryer (Off)	8:30	18:32	3.76	6660	306	422	0.242	0.91	0.136	0.062	0.23	0.035
Hot Water Heater (Off)	8:30	18:32	6.76	6660	167	81	0.025	0.17	0.026	0.006	0.04	0.007
Combined Sources									9.5			1.0

Table E-3
Print Towels Emission Factors
G&K Services, Inc. - May 14, 2009

Source	Emission Period Start Time	Emission Period Stop Time	Emission Period Duration (hours)	Soiled Towel Weight (lbs)	Average TOC (ppmC)	Exhaust Flow Rate (scfm)	Average VOC (lb/hour)	Total VOC Emitted During Test Period (lb)	VOC Emission Factor (lb/1000lb)	EPA TO-15 Total HAPs (lb/hour)	Total HAP Emitted During Test Period (lb)	HAP Emission Factor (lb/1000lb)
Towel Wash Room (day)	7:11	17:44	10.55	3000	879	4893	8.52	89.9	30.0	1.33	14.0	4.68
EQ Tanks (day)	7:11	17:44	10.55	3000	1042	322	0.76	8.06	2.69	0.104	1.10	0.37
Dryer (On)	7:11	17:44	2.87	3000	4930	6431	66.6	191	63.6	5.06	14.5	4.83
Hot Water Heater (On)	7:11	17:44	1.35	3000	20.9	1030	0.043	0.058	0.019	0.007	0.009	0.003
Dryer (Off)	7:11	17:44	7.68	3000	580	422	0.48	3.72	1.24	0.076	0.58	0.19
Hot Water Heater (Off)	7:11	17:44	9.2	3000	612	81	0.098	0.90	0.30	0.015	0.14	0.047
Towel Wash Room (night)	17:44	1:59	8.25	3000	103	4893	1.00	8.22	2.74	0.156	1.28	0.43
EQ Tanks (night)	17:44	7:15	13.52	3000	973	322	0.71	9.66	3.22	0.097	1.31	0.44
Combined Sources									103.8			11.0

Table E-4
RTAP Evaluation - NH Code of Administrative Rules Env-A 1400
G&K Services, Inc.

		De Minimis Evaluation						50% AAL Evaluation Using Adjusted In-Stack Conc. Method					
CAS #	Analyte	24-Hr *De Minimis* (lb/day)	24-Hr Towel Plant Emissions (lb/day)	Are Towel Plant Emissions Less Than 24-Hr *De Minimis* ?	Annual *De Minimis* (lb/yr)	Annual Towel Plant Emissions (lb/yr)	Are Towel Plant Emissions Less Than Annual *De Minimis* ?	50% of 24-Hr AAL ($\mu g/m^3$)	24-Hr Adjusted In-Stack Conc per Env-A 1405.05 ($\mu g/m^3$)	Are Towel Plant Emissions Less than 50% of 24-Hr AAL?	50% of Annual AAL ($\mu g/m^3$)	Annual Adjusted In-Stack Conc per Env-A 1405.05 ($\mu g/m^3$)	Are Towel Plant Emissions Less than 50% of Annual AAL?
64-17-5	Ethanol	74	1.7	Yes	27,147	248	Yes						
67-64-1	Acetone	33	2.7	Yes	12,180	374	Yes						
67-63-0	2-Propanol	14	1.5	Yes	5,044	201	Yes						
75-09-2	Methylene Chloride	4.9	0.1	Yes	1,783	17	Yes						
110-54-3	n-Hexane	7	0.3	Yes	2,541	38	Yes						
78-93-3	2-Butanone (MEK)	39	0.3	Yes	14,353	40	Yes						
107-06-2	1,2-Dichloroethane	1.1	0.4	Yes	410	53	Yes						
142-82-5	Heptane	65	0.8	Yes	23,681	118	Yes						
79-01-6	Trichloroethene	7.6	0.4	Yes	2,759	52	Yes						
108-10-1	4-Methyl-2-pentanone	24	1.3	Yes	8,612	187	Yes						
108-88-3	Toluene	39	4.2	Yes	14,353	573	Yes						
123-86-4	n-Butyl Acetate	28	0.2	Yes	10,296	6	Yes						
127-18-4	Tetrachloroethene	4.8	4.1	Yes	1,743	611	Yes						
100-41-4	Ethylbenzene	7.9	6.5	Yes	2,871	882	Yes						
179601-23-1	m,p-Xylenes	12	17.7	No	1,641	2,391	No	775	94	Yes	50	48	Yes
94-47-6	o-Xylene	12	4.5	Yes	1,641	611	Yes						
98-82-8	Cumene	9.7	1.7	Yes	3,552	226	Yes						
108-67-8	1,3,5-Trimethylbenzene	4.9	8.3	No	1,776	1,122	Yes	309.5	51	Yes	206	23	Yes
95-63-6	1,2,4-Trimethylbenzene	4.9	14.9	No	1,776	2,021	No	309.5	81	Yes	206	22	Yes
111-65-9	Octane	55	2.8	Yes	20,094	382	Yes						
111-84-2	Nonane	123	6.7	Yes	44,854	917	Yes						
91-20-3	Naphthalene	1.5	0.1	Yes	49	18	Yes						
115-07-1	Propene (Propylene)	282	0.3	Yes	102,863	40	Yes						

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APPENDICES

1.0 INTRODUCTION

TRC was retained by G&K to perform emissions testing at the Facility. G&K conducted the emission testing in accordance with the Protocol and the December 30, 2008 letter from the EPA issued under the authority of Section 114(a)(1) of the Clean Air Act.

1.1 Test Program Summary

The Facility receives two types of towels which may contain VOCs and HAPs: shop towels and print towels. The test objective was to develop separate emission factors for shop towels and print towels. The towels are received in plastic bags, washed with detergent and hot water in two 450 pound (dry weight) industrial washers, and then dried in a gas-fired dryer. Hot water for the washers is generated with a natural gas-fired water heater and wastewater from the two washers is treated on site by a dissolved air flotation ("DAF") device.

Facility-wide VOCs and HAPs are potentially emitted from the following sources: the dryer exhaust stack; as area source emissions from the "Towel Wash Room" where receiving, sorting, washing, drying, and wastewater treatment operations are conducted; two wastewater treatment EQ Tanks; and a natural gas-fired hot water heater. Emission tests were conducted on the dryer stack and the hot water heater stack. Tests were also conducted on a temporary room exhaust system installed on the Towel Wash Room for the purpose of the testing and on a separate temporary exhaust system installed on the EQ Tank vents.

The test strategy was to conduct emission tests on two separate days with one day dedicated to shop towels and one day dedicated to print towels. Tests were conducted during a sufficient number of washer loads to develop representative data. The Facility processed twelve washer loads of shop towels during the shop towel test day and five washer loads of print towels during the print towel test day.

Daily actual VOC emissions were determined for each test day by calculating the sum of: (1) area source emissions from the Towel Wash Room; (2) towel drying emissions; (3) EQ Tanks emissions; and (4) hot water heater stack emissions. Emission factors were determined for each towel type on the basis of pounds of emissions per pound of soiled towel weight (lb/lb-soiled weight).

The test program included several methods and temporary exhaust systems were installed on the Towel Wash Room and the EQ Tank vents. Total VOC emission concentrations were measured in accordance with EPA Methods 25 and 25A. Method 25A was used to measure emissions semi-continuously over the entire duration of the test from all 4 emission points and EPA Method 25 was used to determine a response factor for Method 25A. Individual HAP and RTAP emissions were measured in accordance with EPA Method TO-15. The Towel Wash Room was operated as a permanent enclosure in accordance with EPA Method 204 criteria.

1.2 Test Program Organization

Table 1-1 presents the applicable contact information.

Table 1-1 Contact Information		
G&K Services-Environmental Engineer	Mr. Brian Duffy	(952) 912-5713
G&K Services-Site Contact	Mr. Bob Hippert	(603) 625-9722
EPA Region I-Environmental Engineer	Mr. Bill Osbahr	(613) 918-8389
NHDES – Testing and Monitoring Supervisor	Mr. Mike O'Brien	(603) 271-1089
TRC Project Manager	Mr. Jim Canora	(860) 298-6304 (860) 559-3650 (mobile)
TRC Field Team Leader and Test Coordinator	Mr. Ray Potter	(860) 298-6337 (860) 214-0867 (mobile)
TRC QA/QC Officer	Mr. Howie Schiff	(978) 656-3542

2.0 SOURCE DESCRIPTION

2.1 Process Description

G&K operates an industrial laundry at the Facility. There are two separate buildings, one for clean product storage and the other for all Towel Wash Room operations. The two buildings are connected by a large open doorway. The Towel Wash Room building consists of 5,500 square feet of total floor space and contains the receiving and sorting area, two washers (each rated at 450 pounds per load), one gas-fired hot water heater (3.0 MMBtu/hr heat input capacity), one gas-fired dryer (2.25 MMBtu/hr heat input capacity, 450 pounds per load), and the wastewater treatment equipment. In addition, there are two 22,000-gallon EQ Tanks associated with wastewater treatment that are located outside of the building. A floor plan drawing showing equipment locations is presented in Appendix A.

The complete production cycle for print towels and non-bulk shop towels is described below and is depicted in the flow diagram in Figure 2-1.

1. For the purpose of this test, the print towels and non-bulk shop towels were picked-up at the customer's location and delivered to the Facility as follows:

   Print Towels: Print towels were picked up at the customer's location in sealed plastic bags or covered plastic containers. The soiled product was placed into a plastic bag or plastic container and a soil ticket was placed inside each bag/container. The soil ticket identifies the customer and the product inside the bag/container. The G&K driver attached chain of custody tape to the neck of the bag or the container lid to prevent tampering. Time, date and driver signature were marked on the tape. The bags and plastic containers were stored in a locked trailer at the Facility prior to laundering.

   Non-Bulk Shop Towels from Local Routes: Non-bulk shop towels from local routes were received from customers in perforated plastic bags or metal cage containers. The soiled product was placed into a plastic bag or metal cage container and a soil ticket was placed inside each bag/container. The soil ticket identifies the customer and the product inside the bag/container. The G&K driver attached chain of custody tape to the neck of the bag or the container to prevent tampering. Time, date and driver signature were marked on the tape. These towels were immediately placed in sealed, non-perforated plastic bags upon receipt at the Facility and were taped and labeled with the date, time, and signature. The sealed bags were then stored in the locked trailer prior to laundering. The estimated maximum time between receipt from the customer and placement into plastic bags at the Facility was 7 hours.

   Non-Bulk Shop Towels from Out-of-Town Routes: Non-bulk shop towels from out-of-town routes were received from customers in perforated plastic bags or metal cage containers. The soiled product was placed into a plastic bag or metal cage container and a soil ticket was placed inside each bag/container. The soil ticket identifies the customer and the product inside the bag/container. The G&K driver attached chain of custody tape to the neck of the bag or the container lid to prevent tampering. Time, date and driver signature were marked on the tape. The towels were delivered to a G&K branch office where they were immediately transferred to sealed, non-perforated plastic bags. The sealed bags were transferred to the Facility and stored in the locked trailer prior to laundering. The estimated maximum time between receipt from the customer and placement into plastic bags at the branch office was 9 hours.

2. The sealed, non-perforated plastic bags and covered plastic containers were moved to the SorTech Counting System. Each bag/container was opened and the contents were placed onto the SorTech table. The soil ticket was removed and placed onto a clip board.

3. The SorTech Operator selected the "Shop Towel" or "Print Towel" function. The operator was prompted to place a sample of 10 items on the small scale. This sample was used to determine the average soil weight of each towel. When prompted, the SorTech Operator placed the entire contents of the bag/container onto a conveyor and the product was dumped into a sling and 4-post cart which sits on the large floor scale. The system uses the average weight of each towel to determine the number of towels contained in the bag/container.

4. The SorTech Operator recorded the piece count contained in each bag/container on the soil ticket.

5. The SorTech Operator continued counting product until the sling was full. Once the sling was filled to the proper weight, the SorTech Operator filled out a weight ticket for each sling. The proper soiled weights are:

   - o Shop Towels — 185 pounds per sling
   - o Print Towels — 200 pounds per sling

6. Once a sling was at the proper soiled weight, the SorTech Operator covered the sling in plastic.

7. The sling was lifted in the air via the hoist and loaded onto the monorail system.

8. Once a washer became available, three slings of each product (shop or print towels) were loaded into a washer.

9. The wash floor operator recorded the following items on the washer log:

   - o Product description (Shop Towel or Print Towel)
   - o Formula selected
   - o Total weight of all three slings to the nearest pound
   - o Start time
   - o Stop time

- Wash Floor Operator initials

10. The operator repeated the process of counting product with SorTech until all products were counted, loaded in slings and washed.

11. When all soil tickets were complete they were given to the office. The number of pieces counted from each bag was entered into IMPAC and the customer will receive that volume of pieces on their next delivery.

12. The wash times were:

    - 40-45 minutes for shop towels
    - 50-55 minutes for print towels

13. When the wash cycle was complete, the towels were loaded onto the shuttle conveyor to await an open dryer. Once a dryer was available, the towels were loaded into the back of the dryer via the conveyer.

14. The dryer times were 25-30 minutes for both shop towels and print towels.

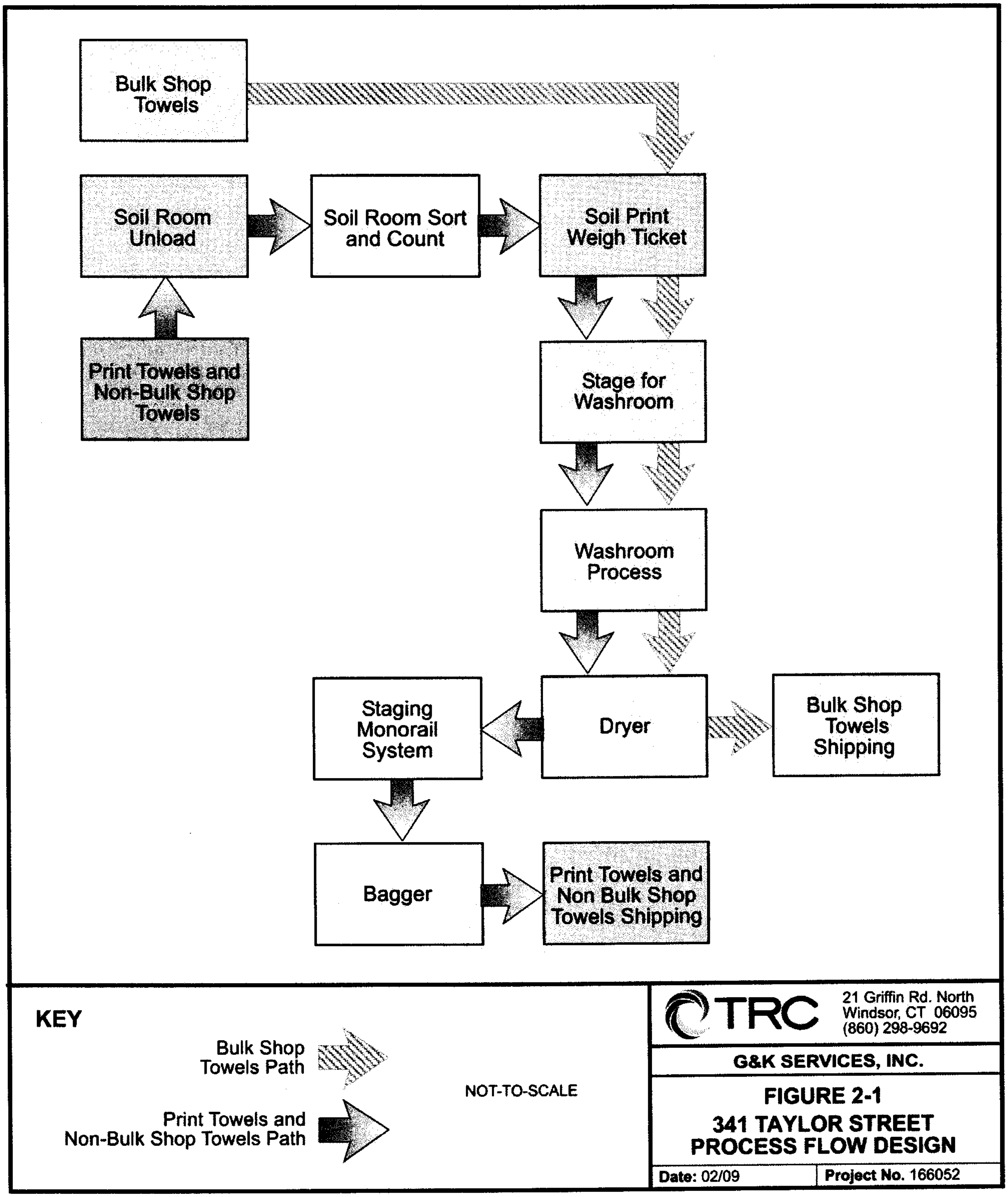
15. When the product was dried, it was unloaded into carts or into clean slings and moved to the shop towel bagging machine. The towels were bagged in the following counts:

    - 18x18 shop towels 50 towels per bag
    - 18x30 print towels 25 towels per bag

The complete production cycle for bulk shop towels differs slightly from the cycle listed immediately above for print towels and non-bulk shop towels. Bulk shop towels are received from customers in sealed, non-perforated plastic bags or carts. The carts are covered and sealed at the customers' facilities prior to being loaded onto G&K trucks. The covers for the carts are plastic bags that are shrink-wrapped with poly wrap. For the purpose of this test, the plastic bags and carts were taped and labeled at the customers' facilities with the date, time, and driver signature. The towels were delivered to the branch offices and then transported to the Facility, where they were stored in the locked trailer prior to laundering. The SorTech Operator placed the bulk shop towels directly into slings to the appropriate weight. The SorTech Operator then filled out a soiled weight ticket, covered the sling in plastic, and staged it for washing as stated above. The bulk shop towels underwent the same washing and drying process as non-bulk shop towels. The dried bulk shop towels were returned to their shipping containers and sent back to their location of origin.

2.2 Control Equipment Description

Towel Wash Room area source emissions are controlled by minimizing air contact with the soiled towels and by efficient detergent cleaning. Soiled towels are stored in covered plastic bins prior to washing. Immediately prior to washing, the towels are placed in slings for transfer to the washers and air exposure is minimized. Water soluble VOCs dissolve in the washer water and low volatility VOCs are expected to adhere to the detergents.


Bulk Shop Towels
Soil Room Unload
Soil Room Sort and Count
Soil Print Weigh Ticket
Print Towels and Non-Bulk Shop Towels
Stage for Washroom
Washroom Process
Staging Monorail System
Dryer
Bulk Shop Towels Shipping
Bagger
Print Towels and Non Bulk Shop Towels Shipping
KEY
Bulk Shop Towels Path
Print Towels and Non-Bulk Shop Towels Path
NOT-TO-SCALE
TRC
21 Griffin Rd. North
Windsor, CT 06095
(860) 298-9692
G&K SERVICES, INC.
FIGURE 2-1
341 TAYLOR STREET
PROCESS FLOW DESIGN
Date: 02/09
Project No. 166052

3.0 SUMMARY AND DISCUSSION OF RESULTS

The test was conducted in accordance with the protocol with modifications that are identified in the discussions below. The Towel Wash Room temporary exhaust system was operated throughout the test in accordance with EPA Method 204 with a single NDO; the NDO face velocity was greater than 200 feet per minute and the temporary enclosure negative pressure was below -0.007 inches of water. The temporary enclosure on the EQ Tank vents was also operated in compliance with EPA Method 204 with an opening face velocity greater than 200 feet per minute.

Table 3-1 presents a summary of historical annual VOC/HAP emissions based on the emissions test and facility operations data for the years 2003 to 2008. The 2003 to 2008 production data used to calculate historical actual emissions is determined from the following information sources:

- Years 2003 to 2006 represent the towels processed at the Facility as reported by Alltex Uniform Rental Service, Inc., to the Uniform and Textile Service Association ("UTSA"), an industrial laundry trade association. G&K understands that this dataset reported to UTSA is based on the recorded number of towel loads laundered multiplied by the nameplate capacity of the washer. This methodology represents an appropriate estimate for purposes of emission calculations.

- Years 2007 and 2008 represent the weight of towels processed as recorded by the Dober data historian system that was installed in mid-2006. Please note that for the majority of the calendar year 2007, the estimated total weight of the towels for any given period was calculated by multiplying the number of towel loads by the estimated weight per load of towels. For the year 2008, the actual weight of each towel load was manually entered and recorded into the Dober system. The 2008 procedure was used to quantify and record the weight of towels processed during the May 2009 emissions test.

Sections 3.1 and 3.2 specify the methodology used to measure and calculate VOC, HAP, and RTAP emissions from the processing of shop towels and print towels, respectively, at the towel plant. Section 3.3 provides a regulatory applicability and compliance analysis of relevant Federal and State air quality rules. Section 3.4 presents an evaluation of the industrial hygiene in the Towel Wash Room during the emissions testing.

3.1 Shop Towel Emissions

A summary of total VOC and HAP emissions data for the shop towel test are presented in Tables 3-1 and 3-2. The facility-wide emission factor for total VOCs is 9.5 pounds of emissions as carbon per 1000 pounds of soiled towel weight (lb/1000 lb) and the emission factor for total HAPs is

1.0 lb/1000 lb. Applying these emission factors to annual shop towel throughput from years 2003 to 2008 yields VOC emissions between 2.5 and 4.3 tpy and combined HAP emissions between 0.3 and 0.5 tpy.

The VOC emission factors were determined for each source by measuring the average concentration in accordance with EPA Method 25A. Method 25A response factors were developed for each source with EPA Method 25 and emissions were calculated in accordance with the example calculations provided in Appendix I. Twelve shop towel washer loads were processed during the test period which consisted of a 10.03 hour period. VOC emissions were measured over most of the period; although, there were several breaks in the VOC monitoring (Method 25A) for calibrations. There was also approximately 2 hours of unusable monitoring data on the Towel Wash Room and the EQ Tanks during the first and second washer loads because the pump malfunctioned on the Towel Wash Room analyzer and the EQ Tanks analyzer was used for troubleshooting. The corrective action was to replace the Towel Wash Room analyzer. However, we believe that the periods of unusable data had no effect on the emission factor determination as emission variability was minimal over the entire test period.

The HAP emission factors were based on EPA Method TO-15 tests and were determined for each source by summing the organic compounds listed in Title III of the 1990 Clean Air Act Amendments. Similar to the emission factor development for VOC, the stack test mass emission rate for the day of each HAP and RTAP was applied to the production rate during the stack test in order to develop a lb of pollutant per 1000 lb of soiled towel throughput. Table 3-3 presents a summary of HAP and RTAP emissions measured by EPA Method TO-15. Table 3-3 also denotes certain compounds that are not regulated VOCs; however, as a conservative measure, these non-VOCs are not subtracted from the VOC emissions measured by Methods 25 and 25A.

There were eleven HAPs and 23 RTAPs detected in one or more samples; HAPs and RTAPs that were not detected in all three samples are not shown in Table 3-3 and their respective emissions are treated as zero. If a HAP/RTAP was detected in one or two samples, but non-detected in the other samples, a concentration of one half (½) the detection limit was used for the non-detect samples to calculate the total emissions. This method of addressing non-detect samples is based on the EPA's Maximum Achievable Control Technology ("MACT") rule for the Plywood and Composite Wood Products in 40 CFR 63.2262(g)(2), which states the following:

(2) When showing compliance with the production-based compliance options in Table 1A to this subpart, you may treat emissions of an individual HAP as zero if all three of the performance test runs result in a nondetect measurement, and the method detection limit is less than or equal to 1 parts per million by volume, dry basis (ppmvd). Otherwise, nondetect data for individual HAP must be treated as one-half of the method detection limit.

3.2 Print Towel Emissions

A summary of total VOC and HAP emissions data for the print towel test are presented in Tables 3-1 and 3-4. The facility-wide emission factor for total VOCs is 103.8 lb/1000 lb and the emission factor for total HAPs is 11.0 lb/1000 lb. Applying these emission factors to annual print towel throughput from years 2003 to 2008 yields VOC emissions between 12.4 and 19.5 tpy and combined HAP emissions between 1.3 and 2.1 tpy.

The VOC emission factors were determined for each source by measuring the average concentration in accordance with EPA Method 25A and the EPA Method 25 response factor as described above. Five print towel washer loads were processed during the test period which consisted of a 10.55 hour period. The protocol specified six print towel washer loads for the test; however, based on Towel Wash Room conditions, the sixth washer load was not included. Bill Osbahr approved the modification to a five print towel load test at the Facility during the time of testing.

VOC emissions were measured over most of the period; although, as during the shop towel tests, there were several breaks in the VOC monitoring (Method 25A) for calibrations. There were also 2 loads (first and second loads) where the VOC data were lost. During the first dryer load, the VOC concentration exceeded the Method 25A calibration range for approximately 6 minutes; this had the effect of biasing the results low. Therefore, this data was not included in the emission factor determination. The second dryer load was also biased low because the associated washer load was run twice (the drain had plugged and the washer cycle had to be re-started). The data from the second dryer load test was also excluded from the dryer emission factor determination and the emission factor was based on the average VOC concentrations from loads 3, 4, and 5. The variability of emissions was minimal over the third, fourth and fifth dryer loads and we believe that using the three load average instead of a five load average had minimal impact on the emission factors. Please note that Bill Osbahr of the EPA was aware of the analyzer range and washer problems that occurred during the print towel dryer testing.

The HAP emission factors are based on the EPA Method TO-15 test results and were determined for each source by summing the organic compounds listed in Title III of the 1990 Clean Air Act Amendments. The same methodology for the treatment of non-detect samples and for calculating HAPs and RTAPs that is explained in Section 3.1 was utilized also for print towel emissions of HAP and RTAP. Table 3-5 presents a summary of HAP and RTAP emissions measured by EPA Method TO-15.

3.3 Comparison with Applicable Emissions Regulations

G&K has identified the following air quality programs that are relevant to VOC, HAP, and RTAP emissions at the towel plant:

- Chapter Env-A 600: Statewide Permit System
- Chapter Env-A 700: Permit Fee System
- Chapter Env-A 900: Owner or Operator Recordkeeping and Reporting Obligations
- Chapter Env-A 1200: Prevention, Abatement, and Control of Stationary Source Air Pollution
- Chapter Env-A 1400: Regulated Toxic Air Pollutants
- 40 CFR Part 60: New Source Performance Standards
- 40 CFR Parts 61 and 63: National Emission Standards for Hazardous Air Pollutants

Note in general that the NHDES rules, except for Chapter Env-A 1400, are approved by EPA in the State Implementation Plan (SIP). Therefore, the air quality regulatory analysis focuses on the State regulations and not the underlying Federal programs that provide the criteria for SIP approval of the relevant New Hampshire rules.

3.3.1 Chapter Env-A 600: Statewide Permit System

Chapter Env-A 600 regulates the operation and modification of new and existing sources of air pollution. The following regulatory applicability emission thresholds are established in this chapter as it pertains to VOC emissions.

- Part Env-A 607: A temporary permit is required for two activities:
  - Under Env-A 607.01(g) for a new or modified stationary source, area source, or device with total actual VOC emissions greater than 10 tpy. The 10 tpy permit threshold is a state-only level with no underlying Federal regulatory program, as noted in the Appendix to Chapter Env-A 600.

- Under Env-A 607.01(aa) for a major source of HAP subject to Section 112(g) and 40 CFR 63. The major source thresholds are 10 tpy of a single HAP and 25 tpy of combined HAP.

- Part Env-A 618: A nonattainment new source review permit is required for a new major stationary source, defined as any stationary source which emits or has the potential to emit VOC at a rate of 50 tpy or more. The 50 tpy VOC threshold for major nonattainment new source review in Hillsborough County is consistent with the Federal requirements in 40 CFR 51.165(a)(2), as identified in the Appendix to Chapter Env-A 600.

The historical VOC emissions from the Manchester facility are compared to the 10 tpy and 50 tpy thresholds to determine whether further review is required.

Table 3-1 summarizes total actual VOC and HAP emissions from the towel plant between years 2003 and 2008. Actual VOC emissions ranged from 15.5 to 23.8 tpy and actual combined HAP emissions ranged from 1.7 to 2.5 tpy. Emissions from the garment plant are less than 0.5 tpy VOC and HAP, so total facility-wide actual emissions are less than half of the 50 tpy VOC threshold in Part Env-618 and less than half of the 10/25 tpy HAP thresholds referenced in Env-A 607.01(aa). Actual VOC emissions exceed the 10 tpy state threshold in Env-A 607.01(g) for a temporary permit.

G&K is submitting, concurrently with this test report, a permit application with corresponding permit fees to the NHDES.

3.3.2 Chapter Env-A 700: Permit Fee System

Chapter Env-A 700, in part, establishes a fee system for permits. As described in Sections 3.3.1 of this report, G&K will be applying for a State temporary permit and paying the appropriate permit fees.

3.3.3 Chapter Env-A 900: Owner or Operator Recordkeeping and Reporting Obligations

Parts Env-A 904 and 908 of this chapter require sources with actual VOC emissions of 10 tpy or more to maintain certain records and submit annual reports to the NHDES. G&K plans to work with the NHDES on the format and content of any required VOC emissions reporting, if information is needed beyond that provided in this test report.

3.3.4 Chapter Env-A 1200: Prevention, Abatement, and Control of Stationary Source Air Pollution

This chapter implements the Federal reasonably available control technology ("RACT") provisions for nonattainment areas on certain VOC-emitting sources in New Hampshire. The Manchester facility is considered a "miscellaneous or multicategory VOC source." The facility would be subject to RACT under this chapter if the combined theoretical potential VOC emissions ("TPE") for all processes and devices equal or exceed 50 tons of VOC in any consecutive 12-month period.

Pursuant to Env-A 1204.02(g)(2), G&K is requesting an enforceable permit restriction that maintains the facility's actual VOC emissions during a 12-month period to less than 50 tpy; therefore, Chapter Env-A 1200 shall not apply upon issuance of a permit which incorporates this restriction.

3.3.5 Chapter Env-A 1400: Regulated Toxic Air Pollutants

Based on the stack testing results, G&K's towel plant emits certain RTAPs that are evaluated for applicability to, and compliance with, Chapter Env-A 1400. The evaluation required under the RTAP program calls for emissions to be evaluated against defined acceptable thresholds for individual pollutants. Emissions from the processing of both shop towels and print towels at the towel plant are summed together and listed in Table 3-6 for a comparison of measured RTAP emissions to the corresponding *de minimis* emission thresholds, and where necessary, 50% of the Ambient Air Limits (AAL).

G&K has completed the applicability evaluation using the methodologies specified in Env-A 1402, and through this analysis has determined that all RTAP emissions from the towel plant are exempt from the requirements of this chapter. The exemption criteria, as explained in Env-A 1402.01(c), are as follows:

1. *The actual emissions of the pollutant:*
    a. *Are less than the annual and 24-hour de minimis emission levels for that pollutant;*
    b. *Are less than 50 percent of the annual and 24-hour ambient air limits for that pollutant using the adjusted in-stack concentration method described in Env-A 1405.05 or*
    c. *Are less than 50 percent of the annual and 24-hour ambient air limits for that pollutant using the air dispersion modeling analysis method described in Env-A 1405.02;*

2. *Emissions are not subject to treatment or removal by pollution control equipment prior to being emitted to the ambient air; and*

3. *Documentation that emissions meet one of the criteria specified in (1), above, are retained at the site and made available to the department for inspection for as long as the exemption is claimed.*

The steps completed to demonstrate the exemption are explained below.

Step 1: Data Gathering (Stack Testing)

G&K collected air emission samples utilizing EPA Method TO-15 and Methods 25 and 25A. The test program summary and organization are provided in this test report.

Step 2: Data Compilation and Comparison to Table 1450-1

Emissions data from the TO-15 test were compiled into a spreadsheet and compared to Table 1450-1 as set forth in Env-A 1450.01. As explained previously, G&K applied one-half of the minimum reporting level (MRL) for a pollutant that was not detected (ND) above the laboratory reporting limit for each ND source if at least one source was detected. (Example: n-butyl acetate was detected in the wash room but from none of the other sources while testing. The actual concentration measured for the wash room is utilized and one-half of the MRL is applied to all of the other sources.) If an analyte showed up as ND/MRL for all sources during the test, then the pollutant's emissions were not included in the analysis. The stack test results indicated that 23 RTAPs are subject to evaluation.

Step 3: De Minimis Evaluation

G&K utilized the stack test emission rates for each pollutant as well as daily and annual production information to calculate the actual emissions in pounds per day (lb/day) and pounds per year (lb/year) for each individual pollutant. G&K utilized a throughput quantity of both shop and print towels that exceeds the historical production data in order to be conservative. For example, the highest production rate of shop towels since the year 2003 was 903,831 lb, whereas the rate used for this analysis is 1,000,000 lb. Similarly, the highest historical actual print towel throughput was 376,261 lb; for this analysis, 400,000 lb was used.

The sum of emissions from all emission sources were compared to the *de minimis* thresholds. All but three pollutants were less than the *de minimis* thresholds; m,p-xylenes, 1,3,5-

trimethylbenzene, and 1,2,4-trimethylbenzene exceeded one or both of the *de minimis* thresholds. These three pollutants were then evaluated against the 24-hour and annual ambient air limits (AAL).

Step 4: 50% AAL Evaluation

The three pollutants that were greater than the *de minimis* concentration thresholds were compared to the 24-hour and annual AALs following the "adjusted in-stack concentration method" as set forth in NH Administrative Code Env-A 1405.05. The AALs are intended to promote public health by reducing human exposure to toxic air pollutants. The methodology, similar to the *de minimis* evaluation, utilizes actual emissions.

G&K calculated the 24-hour and annual average concentrations for comparison to the AALs in order to represent actual exposure concentrations. To further clarify, the emission rate that resulted from the stack test (in lb per hour) was converted to 24-hour and annual average values to account for actual hours of operation and material throughput for each evaluation period. The exhaust flow rate from each source, as measured during the test, allowed for conversion to the in-stack concentration. This approach was confirmed with Ms. Pat North, the NHDES Air Toxics Program Manager.[1]

As shown in Table 3-6, the adjusted in-stack concentration of each of the three pollutants is less than 50 percent of their corresponding AAL and is, therefore, exempt from the RTAP program.

3.3.6 New Source Performance Standards

G&K has completed a regulatory applicability analysis of the New Source Performance Standards (NSPS) in 40 CFR Part 60 and as referenced in New Hampshire Rule Part Env-A 503 to equipment at the towel plant. None of the standards are applicable to equipment at the towel plant.

Subpart Kb was evaluated specifically for applicability to each of the equalization tanks located at the towel plant, since the tanks contain a mixture of water and volatile organic liquids. However, the equalization tanks are considered "process tanks" which are exempt under the definition of "storage vessel," the affected facility for this subpart. A process tank is defined in §60.111b as *"a tank that is used within a process (including a solvent or raw material recovery process) to collect material discharged from a feedstock storage vessel or equipment within the*

[1] June 23, 2009, phone conversation between Mr. Jason Linkimer of Barr Engineering Company and Ms. Pat North of NHDES. In the call, Ms. North confirmed that actual emissions on a 24-hour or annual average should take into account the actual hours of operation and production rates for evaluation of applicability to or compliance with the AALs.

process before the material is transferred to other equipment within the process, to a product or by-product storage vessel, or to a vessel used to store recovered solvent or raw material. In many process tanks, unit operations such as reactions and blending are conducted. Other process tanks, such as surge control vessels and bottoms receivers, however, may not involve unit operations." Because the equalization tanks serve as pre-treatment of the wash water mixture via the process of blending and agitation before the wastewater is sent to downstream equipment, the tanks qualify as "process tanks" and are not "storage vessels" as defined in Subpart Kb.

3.3.7 National Emission Standards for Hazardous Air Pollutants

G&K completed an applicability analysis of the National Emission Standards for Hazardous Air Pollutants ("NESHAPs") under both 40 CFR 61 and 63 as referenced in Parts Env-A 504, 505, and 1413. No standards are applicable to the towel plant operations since there are no specific source categories under Section 112(d) of the Clean Air Act that apply to this industrial sector.

Section 112(g) of the Clean Air Act, as promulgated in 40 CFR 63 Subpart B, require a "case-by-case" maximum achievable control technology ("MACT") evaluation for constructed or reconstructed major sources of HAP emissions. Because HAP emissions from the towel plant do not approach the 10 tpy single HAP or 25 tpy combined HAPs thresholds, this rule does not apply. G&K is submitting a permit application to restrict the potential to emit HAP to levels less than the major source thresholds, consistent with past actual emissions.

3.4 Towel Wash Room Industrial Hygiene Evaluation

The emissions tests were conducted with special operating conditions which included closing doors in the Towel Wash Room, controlling the Towel Wash Room ventilation, and processing only one towel type per day. These special operating conditions were expected to create a worst case for VOC concentrations in the room during the print towel test. Total VOC was periodically monitored in the Towel Wash Room with a portable organic vaporizer analyzer and the Method TO-15 tests provided average concentrations of specific organic compounds that can be compared to work place exposure limits. During the print towel test conducted on May 14, 2009 the Method TO-15 data from the Towel Wash Room showed that average concentrations were below the OSHA permissible exposure limits ("PELs") expressed as time weighted averages ("TWAs"). A comparison of Towel Wash Room concentrations to the TWAs are shown in Table 3-7 for both the print towel and shop towel tests.

Table 3-1
Historical Annual VOC and Federal HAP Emissions - Towel Plant
G&K Services, Inc.

VOC and Total Federal HAP Emissions (tons per year)

	2003	2004	2005	2006	2007	2008
Shop Towel VOC	3.2	2.5	2.8	2.9	3.0	4.3
Printer Towel VOC	12.4	13.6	15.4	13.9	16.4	19.5
Shop Towel HAP	0.35	0.27	0.31	0.31	0.33	0.47
Printer Towel HAP	1.3	1.4	1.6	1.5	1.7	2.1
TOTAL VOC	**15.5**	**16.1**	**18.3**	**16.8**	**19.4**	**23.8**
TOTAL HAP	**1.7**	**1.7**	**1.9**	**1.8**	**2.1**	**2.5**

Individual Federal HAP Emissions (tons per year)

	2003	2004	2005	2006	2007	2008
Methylene Chloride	0.0054	0.0047	0.0054	0.0052	0.0057	0.0077
n-Hexane	0.011	0.012	0.014	0.012	0.014	0.018
1,2-Dichloroethane	0.017	0.014	0.016	0.016	0.017	0.024
Trichloroethene	0.017	0.014	0.016	0.016	0.017	0.024
Toluene	0.17	0.18	0.20	0.19	0.21	0.26
Tetrachloroethene	0.20	0.17	0.19	0.19	0.20	0.28
Ethylbenzene	0.26	0.28	0.32	0.29	0.34	0.41
Cumene	0.067	0.073	0.083	0.075	0.09	0.11
Naphthalene	0.0057	0.0051	0.0057	0.0055	0.0061	0.0081
m,p-Xylenes	0.71	0.77	0.87	0.79	0.93	1.1
o-Xylene	0.18	0.20	0.22	0.20	0.24	0.28
Xylenes (Isomers/Mixture)[1]	0.9	1.0	1.1	1.0	1.2	1.4

Weight of Towels Processed to Calculate Annual Emissions (pounds per year)

	2003	2004	2005	2006	2007	2008
Shop Towel	667,800	525,600	592,650	597,938	635,675	903,831
Printer Towel	238,050	261,450	297,450	268,425	315,821	376,261

Performance Test Emission Factors Used To Calculate Annual Emissions (lb pollutant / 1000 lb towels processed

VOC and Total HAP	
Shop Towel VOC	9.5
Shop Towel Total HAP	1.0
Printer Towel VOC	103.8
Printer Towel Total HAP	11.0

Individual HAP	Shop Towels	Print Towels
Methylene Chloride	1.2E-02	1.3E-02
n-Hexane	5.0E-03	8.1E-02
1,2-Dichloroethane	4.7E-02	1.4E-02
Trichloroethene	4.6E-02	1.4E-02
Toluene	1.3E-01	1.1E+00
Tetrachloroethene	5.4E-01	1.8E-01
Ethylbenzene	4.7E-02	2.1E+00
m,p-Xylenes	1.5E-01	5.6E+00
o-Xylene	4.9E-02	1.4E+00
Cumene	1.4E-02	5.3E-01
Naphthalene	1.1E-02	1.6E-02

1. Xylenes (isomers and mixture) are listed in Section 112(b) of the Clean Air Act as an individual HAP, in addition to the individual xylene isomers (m,p-xylenes, o-xylene). Both the individual xylene isomers and the total of all xylene isomers are listed in the individual HAP table but are not "double-counted" for purposes of determining total HAP emissions.

Table 3-2
Shop Towels Emission Factors
G&K Services, Inc. - May 13, 2009

Source	Emission Period Start Time	Emission Period Stop Time	Emission Period Duration (hours) [1]	Soiled Towel Weight (lbs) [2]	Average TOC (ppmC) [3]	Exhaust Flow Rate (scfm)	Average VOC (lb/hour) [4]	Total VOC Emitted During Test Period (lb) [5]	VOC Emission Factor (lb/1000lb) [6]	EPA TO-15 Total HAPs (lb/hour)	Total HAP Emitted During Test Period (lb) [5]	HAP Emission Factor (lb/1000lb) [6]
Towel Wash Room	8:30	18:32	10.03	6660	178	4802	1.60	16.02	2.41	0.41	4.11	0.62
EQ Tanks	8:30	18:32	10.03	6660	420	292	0.24	2.36	0.354	0.03	0.30	0.045
Dryer (On)	8:30	18:32	6.27	6660	568	6357	7.03	44.0	6.61	0.36	2.26	0.34
Hot Water Heater (On) [7]	8:30	18:32	3.27	6660	2.16	954	0.0039	0.0126	0.002	0.0010	0.003	0.0005
Dryer (Off) [7]	8:30	18:32	3.76	6660	306	422	0.242	0.91	0.136	0.062	0.23	0.035
Hot Water Heater (Off) [7]	8:30	18:32	6.76	6660	167	81	0.025	0.17	0.026	0.006	0.04	0.007
Combined Sources									9.5			1.0

1. Twelve shop towel loads were washed and dried and total facility emissions were measured over this duration. Period began when the the first soiled laundry bags were opened and ended when the Towel Wash Room VOC concentration returned to background level.
2. Soiled towel weight is the combined weight of 12 washer loads (12 loads x 555 lb/load).
3. Average TOC data reported in ppm as carbon are based on EPA Method 25A measurements throughout the emission period. Method 25A data were continuous with the exception of calibrations and the first two hours of the emission period for the Towel Wash Room and EQ Tanks.
4. VOC emission rate is calculated from the Method 25A average VOC concentration, measured gas flow rate, and the Method 25 response factor. The calculation is as follows;
   lb/hour = ppmC x scfm x 12 x RF x 2.59E-9 x 60 RF_{WR} = 1.003 RF_{dryer} = 1.043 RF_{tanks} = 1.029 RF_{heater} = 1.003
   Example (Towel Wash Room VOC): lb/hour = 178 x 4802 x 12 x 1.003 x 2.59E-9 x 60 = 1.60
5. Total VOC or HAP emitted during the emission period is calculated as follows:
   lb = lb/hour x hours Example (Towel Wash Room VOC): lb = 10.03 x 1.60 = 16.02 Example 2 (Towel Wash Room HAP): lb = 10.03 x 0.41 = 4.11
6. VOC and HAP emission factors reported as pounds of emissions (VOC is as carbon) per 1000 pounds of soiled towel weight is calculated as follows:
   lb/1000 lb = lb/lb x 1000 Example 1 (Towel Wash Room VOC): lb/1000 lb = 16.02/6600 x 1000 = 2.41 Example 2 (Towel Wash Room HAP): lb/1000lb = 4.11/6600 x 1000 = 0.62
7. HAP emissions for the Hot Water Heater (on and off) and the Dryer-off were determined from the Towel Wash Room TO-15 data and the ratio of the VOC emission rates. An example calculation for the Hot Water Heater (On) is as follows: $HAP_{(lb/hour)}$ = 0.41 x 0.0023/1.6

Table 3-3
Shop Towel HAP and RTAP Emissions - EPA Method TO-15
G&K Services, Inc. - May 13, 2009

Location		Wash Room	EQ Tanks	Dryer	
Test		WR-1	EQ-1	D-1	D-2
Time		0830-1630	0830-1630	0950-1104	1208-1320
Stack Data					
Temperature (°F)		86	90	150	150
Flow Rate (scfm)		4802	292	6357	6357
Moisture (%)		1.0	0.9	4.0	4.0
Propene	V, N				
Concentration (ppm)		0.07	0.34	< 0.02	< 0.01
Emission Rate (lb/hr)		2.1E-03	6.5E-04	< 7.1E-04	< 3.5E-04
Ethanol	V, N				
Concentration (ppm)		2.80	3.70	1.10	0.21
Emission Rate (lb/hr)		9.6E-02	7.7E-03	5.0E-02	9.6E-03
Acetone	N				
Concentration (ppm)		0.93	2.70	0.27	< 0.06
Emission Rate (lb/hr)		4.0E-02	7.1E-03	1.5E-02	< 3.4E-03
2-Propanol	V, N				
Concentration (ppm)		0.31	1.30	0.16	0.09
Emission Rate (lb/hr)		1.4E-02	3.5E-03	9.5E-03	5.5E-03
Methylene Chloride	H, N				
Concentration (ppm)		0.11	< 0.01	< 0.01	< 0.00
Emission Rate (lb/hr)		7.0E-03	<4.0E-05	<7.1E-04	<3.5E-04
2-Butanone	V, N				
Concentration (ppm)		0.20	0.27	0.08	0.03
Emission Rate (lb/hr)		1.1E-02	8.8E-04	5.3E-03	2.3E-03
n-Hexane	V, H, N				
Concentration (ppm)		0.04	< 0.01	< 0.01	0.01
Emission Rate (lb/hr)		2.6E-03	<4.1E-05	<7.2E-04	9.36E-04
1,2 Dichloroethane	V, H, N				
Concentration (ppm)		0.31	0.46	0.14	< 0.004
Emission Rate (lb/hr)		2.3E-02	2.1E-03	1.4E-02	<3.5E-04
Trichloroethene	V, H, N				
Concentration (ppm)		0.21	0.09	0.03	0.16
Emission Rate (lb/hr)		2.1E-02	5.4E-04	4.2E-03	2.1E-02
n-Heptane	V, N				
Concentration (ppm)		0.43	0.12	0.20	0.15
Emission Rate (lb/hr)		3.2E-02	5.5E-04	2.0E-02	1.5E-02
4-Methyl-2-pentanone	V, N				
Concentration (ppm)		0.38	0.44	0.05	0.27
Emission Rate (lb/hr)		2.8E-02	2.0E-03	4.9E-03	2.7E-02
Toluene	V, H, N				
Concentration (ppm)		0.83	1.20	0.40	0.33
Emission Rate (lb/hr)		5.7E-02	5.0E-03	3.6E-02	3.0E-02
n-Butyl Acetate	V, N				
Concentration (ppm)		< 0.02	< 0.02	< 0.01	< 0.01
Emission Rate (lb/hr)		< 1.3E-03	< 8.4E-05	< 1.4E-03	< 7.0E-04

n-Octane	V, N				
Concentration (ppm)		0.10	0.15	0.03	0.07
Emission Rate (lb/hr)		8.5E-03	7.8E-04	3.8E-03	7.4E-03
Tetrachloroethene	H, N				
Concentration (ppm)		1.70	1.10	1.70	0.73
Emission Rate (lb/hr)		2.1E-01	8.3E-03	2.8E-01	1.2E-01
Ethylbenzene	V, H, N				
Concentration (ppm)		0.22	0.60	0.13	0.17
Emission Rate (lb/hr)		1.7E-02	2.9E-03	1.4E-02	1.8E-02
m,p-Xylenes	V, H, N				
Concentration (ppm)		0.66	1.90	0.47	0.59
Emission Rate (lb/hr)		5.2E-02	9.2E-03	4.9E-02	6.2E-02
o-Xylene	V, H, N				
Concentration (ppm)		0.20	0.63	0.14	0.24
Emission Rate (lb/hr)		1.6E-02	3.0E-03	1.5E-02	2.5E-02
n-Nonane	V, N				
Concentration (ppm)		0.37	1.20	0.27	0.35
Emission Rate (lb/hr)		3.5E-02	7.0E-03	3.4E-02	4.4E-02
Cumene	V, H, N				
Concentration (ppm)		0.06	0.25	0.02	0.05
Emission Rate (lb/hr)		5.0E-03	1.4E-03	2.5E-03	5.7E-03
n-Propylbenzene	V				
Concentration (ppm)		0.16	0.80	0.07	0.16
Emission Rate (lb/hr)		1.4E-02	4.4E-03	8.5E-03	1.9E-02
4-Ethyltoluene	V				
Concentration (ppm)		0.35	1.70	0.16	0.32
Emission Rate (lb/hr)		3.1E-02	9.3E-03	1.9E-02	3.8E-02
1,3,5-Trimethylbenzene	V, N				
Concentration (ppm)		0.25	1.40	0.14	0.28
Emission Rate (lb/hr)		2.2E-02	7.6E-03	1.7E-02	3.3E-02
1,2,4-Trimethylbenzene	V, N				
Concentration (ppm)		0.49	2.80	0.37	0.66
Emission Rate (lb/hr)		4.4E-02	1.5E-02	4.4E-02	7.8E-02
d-Limonene	V				
Concentration (ppm)		0.11	0.57	0.87	0.11
Emission Rate (lb/hr)		1.1E-02	3.5E-03	1.2E-01	1.5E-02
Naphthalene	V, H,N				
Concentration (ppm)		0.01	0.22	0.07	0.05
Emission Rate (lb/hr)		1.2E-03	1.3E-03	8.9E-03	6.6E-03
Total Federal HAP Emissions					
Concentration (ppm)		4.4	6.5	3.1	2.3
Emission Rate (lb/hr)		0.41	0.03	0.42	0.29
Dryer Average (lb/hr)				0.36	

Notes:

V = Volatile Organic Compound

H = Federally Regulated Hazardous Air Pollutant (HAP)

N = New Hampshire Department of Environmental Services Regulated Toxic Air Pollutant

Concentrations of non-detect compounds entered at 1/2 of the detection limit

Table 3-4
Print Towels Emission Factors
G&K Services, Inc. - May 14, 2009

Source	Emission Period Start Time	Emission Period Stop Time	Emission Period Duration (hours) [1]	Soiled Towel Weight (lbs) [2]	Average TOC (ppmC) [3]	Exhaust Flow Rate (scfm)	Average VOC (lb/hour) [4]	Total VOC Emitted During Test Period (lb) [5]	VOC Emission Factor (lb/1000lb) [6]	EPA TO-15 Total HAPs (lb/hour)	Total HAP Emitted During Test Period (lb) [5]	HAP Emission Factor (lb/1000lb) [6]
Towel Wash Room (day)	7:11	17:44	10.55	3000	879	4893	8.52	89.9	30.0	1.33	14.0	4.68
EQ Tanks (day)	7:11	17:44	10.55	3000	1042	322	0.76	8.06	2.69	0.104	1.10	0.37
Dryer (On)	7:11	17:44	2.87	3000	4930	6431	66.6	191	63.6	5.06	14.5	4.83
Hot Water Heater (On) [7]	7:11	17:44	1.35	3000	20.9	1030	0.043	0.058	0.019	0.007	0.009	0.003
Dryer (Off) [7]	7:11	17:44	7.68	3000	580	422	0.48	3.72	1.24	0.076	0.58	0.19
Hot Water Heater (Off) [7]	7:11	17:44	9.2	3000	612	81	0.098	0.90	0.30	0.015	0.14	0.047
Towel Wash Room (night)	17:44	1:59	8.25	3000	103	4893	1.00	8.22	2.74	0.156	1.28	0.43
EQ Tanks (night)	17:44	7:15	13.52	3000	973	322	0.71	9.66	3.22	0.097	1.31	0.44
Combined Sources									103.8			11.0

1. Five print towel loads were washed and dried and total facility emissions were measured over this duration. Period began when the the first soiled laundry bags were opened and the day period ended when the 5th dryer load stopped. Night began when the 5th dryer load stopped and ended on the Towel Wash Room when total VOC returned to background level. Night period on the EQ Tanks began when the 5th dryer load stopped and ended at the start of operations on the following morning.
2. Soiled towel weight is the combined weight of 5 washer loads (5 loads x 600 lb/load).
3. Average TOC data reported in ppm as carbon are based on EPA Method 25A measurements throughout the emission period. Method 25A data were continuous with the exception of calibrations. The first dryer load data was discarded because Method 25A was over-range and the second dryer load data was discarded because load was washed twice.
4. VOC emission rate is calculated from the Method 25A average TOC concentration, measured gas flow rate, and the Method 25 response factor. The calculation is as follows;
   lb/hour = ppmC x scfm x 12 x RF x 2.59E-9 x 60 RF_{WR} = 1.063 RF_{dryer} = 1.126 RF_{tanks} = 1.222 RF_{heater} = 1.063
   Example (Towel Wash Room VOC): lb/hour = 879 x 4893 x 12 x 1.063 x 2.59E-9 x 60 = 8.52
5. Total VOC or HAP emitted during the emission period is calculated as follows:
   lb = lb/hour x hours Example (Towel Wash Room VOC): lb = 10.55 x 8.52 = 89.9 Example 2 (Towel Wash Room HAP): lb = 10.55 x 1.33 = 14.03
6. VOC and HAP emission factors reported as pounds of emissions (VOC is as carbon) per 1000 pounds of soiled towel weight is calculated as follows:
   lb/1000 lb = lb/lb x 1000 Example 1 (Towel Wash Room VOC): lb/1000 lb = 89.9/3000 x 1000 = 30.0 Example 2 (Towel Wash Room HAP): lb/1000lb = 14.03/3000 x 1000 = 4.7
7. HAP emissions for the Hot Water Heater (on and off) and the Dryer-off were determined from the Towel Wash Room TO-15 data and the ratio of the VOC emission rates. An example calculation for the Hot Water Heater (On) is as follows: $HAP_{(lb/hour)}$ = 1.33 x 0.043/8.52 = 0.007

Table 3-5
Print Towel HAP and RTAP Emissions - EPA Method TO-15
G&K Services, Inc. - May 14, 2009

Location		Washroom	EQ Tanks	Dryer	
Test		WR-2	EQ-2	D-3	D-4
Time		0830-1630	0830-1630	1023-1333	1431-1632
Stack Data					
Temperature (F)		82	69	159	159
Flowrate (SCFM)		4893	322	6431	6431
Moisture (%)		1.3	1.3	4.9	4.9
Propene	V, N				
Concentration (ppm)		0.54	0.55	< 0.16	< 0.15
Emission Rate (lb/hr)		1.7E-02	1.2E-03	< 6.7E-03	< 6.1E-03
Ethanol	V, N				
Concentration (ppm)		< 0.35	1.40	< 1.45	< 1.35
Emission Rate (lb/hr)		< 1.2E-02	3.2E-03	< 6.7E-02	< 6.2E-02
Acetone	N				
Concentration (ppm)		3.30	3.00	< 1.15	< 1.05
Emission Rate (lb/hr)		1.5E-01	8.7E-03	< 6.7E-02	< 6.1E-02
2-Propanol	V, N				
Concentration (ppm)		1.80	2.10	0.47	0.60
Emission Rate (lb/hr)		8.2E-02	6.3E-03	2.8E-02	3.6E-02
Methylene Chloride	H, N				
Concentration (ppm)		< 0.02	0.05	< 0.08	< 0.07
Emission Rate (lb/hr)		< 1.2E-03	2.0E-04	< 6.8E-03	< 5.9E-03
2-Butanone	V, N				
Concentration (ppm)		0.14	0.24	< 0.09	< 0.09
Emission Rate (lb/hr)		7.7E-03	8.7E-04	< 6.5E-03	< 6.1E-03
n-Hexane	V, H, N				
Concentration (ppm)		0.28	0.05	< 0.08	< 0.07
Emission Rate (lb/hr)		1.8E-02	2.3E-04	< 6.5E-03	< 6.0E-03
1,2 Dichloroethane	V, H, N				
Concentration (ppm)		< 0.02	0.09	< 0.07	< 0.06
Emission Rate (lb/hr)		< 1.2E-03	4.6E-04	< 6.4E-03	< 5.9E-03
Trichloroethene	V, H, N				
Concentration (ppm)		< 0.01	0.06	< 0.05	< 0.05
Emission Rate (lb/hr)		< 1.2E-03	3.7E-04	< 6.6E-03	< 6.1E-03
n-Heptane	V, N				
Concentration (ppm)		0.32	0.14	0.18	0.18
Emission Rate (lb/hr)		2.4E-02	7.0E-04	1.8E-02	1.8E-02
4-Methyl-2-pentanone	V, N				
Concentration (ppm)		0.80	1.40	< 0.07	< 0.06
Emission Rate (lb/hr)		6.1E-02	7.0E-03	< 6.5E-03	< 6.0E-03
Toluene	V, H, N				
Concentration (ppm)		2.90	3.30	3.50	0.17
Emission Rate (lb/hr)		2.0E-01	1.5E-02	3.2E-01	1.6E-02
n-Butyl Acetate	V, N				
Concentration (ppm)		0.10	< 0.02	< 0.06	< 0.06
Emission Rate (lb/hr)		8.4E-03	< 9.6E-05	< 6.4E-03	< 6.4E-03

n-Octane	V, N				
Concentration (ppm)		1.50	0.69	3.30	3.00
Emission Rate (lb/hr)		1.3E-01	3.9E-03	3.8E-01	3.4E-01
Tetrachloroethene	H, N				
Concentration (ppm)		0.24	0.83	< 0.04	< 0.04
Emission Rate (lb/hr)		3.0E-02	6.9E-03	< 6.6E-03	< 6.1E-03
Ethylbenzene	V, H, N				
Concentration (ppm)		3.00	3.20	7.10	12.00
Emission Rate (lb/hr)		2.4E-01	1.7E-02	7.5E-01	1.3E+00
m,p-Xylenes	V, H, N				
Concentration (ppm)		7.60	8.60	21.00	33.00
Emission Rate (lb/hr)		6.1E-01	4.6E-02	2.2E+00	3.5E+00
o-Xylene	V, H, N				
Concentration (ppm)		1.90	2.40	5.60	7.80
Emission Rate (lb/hr)		1.5E-01	1.3E-02	5.9E-01	8.3E-01
n-Nonane	V, N				
Concentration (ppm)		2.20	1.80	9.50	7.90
Emission Rate (lb/hr)		2.1E-01	1.2E-02	1.2E+00	1.0E+00
Cumene	V, H, N				
Concentration (ppm)		0.65	0.77	2.40	2.00
Emission Rate (lb/hr)		5.9E-02	4.6E-03	2.9E-01	2.4E-01
n-Propylbenzene	V				
Concentration (ppm)		1.70	2.20	7.90	6.20
Emission Rate (lb/hr)		1.6E-01	1.3E-02	9.5E-01	7.4E-01
4-Ethyltoluene	V				
Concentration (ppm)		3.40	4.60	17.00	13.00
Emission Rate (lb/hr)		3.1E-01	2.8E-02	2.0E+00	1.6E+00
1,3,5-Trimethylbenzene	V, N				
Concentration (ppm)		2.60	3.50	15.00	11.00
Emission Rate (lb/hr)		2.4E-01	2.1E-02	1.8E+00	1.3E+00
1,2,4-Trimethylbenzene	V, N				
Concentration (ppm)		4.50	6.40	27.00	20.00
Emission Rate (lb/hr)		4.1E-01	3.8E-02	3.2E+00	2.4E+00
d-Limonene	V				
Concentration (ppm)		0.39	0.62	4.30	2.40
Emission Rate (lb/hr)		4.0E-02	4.2E-03	5.9E-01	3.3E-01
Naphthalene	V, H, N				
Concentration (ppm)		< 0.01	0.11	< 0.05	< 0.05
Emission Rate (lb/hr)		< 1.2E-03	7.1E-04	< 6.4E-03	< 6.1E-03
Total Federal HAP Emissions					
Concentration (ppm)		16.6	19.5	40.0	55.3
Emission Rate (lb/hr)		1.33	0.10	4.23	5.89
Dryer Average (lb/hr)				5.06	

Notes:

V = Volatile Organic Compound

H = Federally Regulated Hazardous Air Pollutant (HAP)

N = New Hampshire Department of Environmental Services Regulated Toxic Air Pollutant

Concentrations of non-detect compounds entered at 1/2 of the detection limit

Table 3-6
RTAP Evaluation - NH Code of Administrative Rules Env-A 1400
G&K Services, Inc.

		De Minimis Evaluation[1]						50% AAL Evaluation Using Adjusted In-Stack Conc. Method[1]					
CAS #	Analyte	24-Hr *De Minimis* (lb/day)	24-Hr Towel Plant Emissions (lb/day)[2]	Are Towel Plant Emissions Less Than 24-Hr *De Minimis* ?	Annual *De Minimis* (lb/yr)	Annual Towel Plant Emissions (lb/yr)[3]	Are Towel Plant Emissions Less Than Annual *De Minimis* ?	50% of 24-Hr AAL (µg/m³)	24-Hr Adjusted In-Stack Conc per Env-A 1405.05 (µg/m³)[2]	Are Towel Plant Emissions Less than 50% of 24-Hr AAL?	50% of Annual AAL (µg/m³)	Annual Adjusted In-Stack Conc per Env-A 1405.05 (µg/m³)[3]	Are Towel Plant Emissions Less than 50% of Annual AAL?
64-17-5	Ethanol	74	1.7	Yes	27,147	248	Yes						
67-64-1	Acetone	33	2.7	Yes	12,180	374	Yes						
67-63-0	2-Propanol	14	1.5	Yes	5,044	201	Yes						
75-09-2	Methylene Chloride	4.9	0.1	Yes	1,783	17	Yes						
110-54-3	n-Hexane	7	0.3	Yes	2,541	38	Yes						
78-93-3	2-Butanone (MEK)	39	0.3	Yes	14,353	40	Yes						
107-06-2	1,2-Dichloroethane	1.1	0.4	Yes	410	53	Yes						
142-82-5	Heptane	65	0.8	Yes	23,681	118	Yes						
79-01-6	Trichloroethene	7.6	0.4	Yes	2,759	52	Yes						
108-10-1	4-Methyl-2-pentanone	24	1.3	Yes	8,612	187	Yes						
108-88-3	Toluene	39	4.2	Yes	14,353	573	Yes						
123-86-4	n-Butyl Acetate	28	0.2	Yes	10,296	6	Yes						
127-18-4	Tetrachloroethene	4.8	4.1	Yes	1,743	611	Yes						
100-41-4	Ethylbenzene	7.9	6.5	Yes	2,871	882	Yes						
179601-23-1	m,p-Xylenes[4]	12	17.7	No	1,641	2,391	No	775	94	Yes	50	48	Yes
94-47-6	o-Xylene	12	4.5	Yes	1,641	611	Yes						
98-82-8	Cumene	9.7	1.7	Yes	3,552	226	Yes						
108-67-8	1,3,5-Trimethylbenzene	4.9	8.3	No	1,776	1,122	Yes	309.5	51	Yes	206	23	Yes
95-63-6	1,2,4-Trimethylbenzene	4.9	14.9	No	1,776	2,021	No	309.5	81	Yes	206	22	Yes
111-65-9	Octane	55	2.8	Yes	20,094	382	Yes						
111-84-2	Nonane	123	6.7	Yes	44,854	917	Yes						
91-20-3	Naphthalene	1.5	0.1	Yes	49	18	Yes						
115-07-1	Propene (Propylene)	282	0.3	Yes	102,863	40	Yes						

1. In order to be exempt from Chapter Env-A 1400, the facility must demonstrate per Env-A 1402.01(c) that actual pre-control pollutant emissions are either less than the de minimis levels or less than 50% of the ambient air limits (AALs) using the adjusted in-stack concentration method or dispersion modeling analysis method. The dispersion modeling analysis method is not conducted since the use of the de minimis evaluation in conjunction with the adjusted in-stack concentration method demonstrates that the G&K Manchester Towel Plant meets the Env-A 1400 exemption.

2. In order to conservatively represent 24-hr average actual emissions and ambient concentrations for purposes of this exercise, twelve loads (6,660 pounds) of shop towels and five loads (3,000 pounds) pounds of print towels are assumed to be processed in a given day. These values are equivalent to the weight of towels processed during the May 13-14, 2009 test. By comparison, a normal operating day consists of ten to twelve loads of shop towels and one to three loads of print towels. The daily estimation of towel throughput used in this exercise should not be construed as enforceable limitations.

3. In order to conservatively represent annual average actual emissions and ambient concentrations for purposes of this exercise, 1,000,000 pounds of shop towels and 400,000 pounds of print towels are assumed to be processed in a year. By comparison, the highest historical annual throughput since 2003 is 903,831 pounds of shop towels and 376,261 pounds of print towels. The annual values of towel throughput used in this exercise should not be construed as enforceable limitations.

4. Table 1450-1 of Env-A 1450.01 identifies m-xylene and p-xylene as separate RTAPs with the same individual *de minimis* and AALs that match the values shown in this table for combined m,p-xylene. Because m-xylene and p-xylene coellute during the analytical method used in the performance test, emissions of the individual isomers cannot be separated. As a conservative measure for demonstrating exemption under Env-A 1400, the combined emissions of m,p-xylene are compared to the *de minimis* and 50% AAL of only one of the isomers, which essentially assumes that all of the emissions are either all m-xylene or all p-xylene.

Table 3-7
Industrial Hygiene Evaluation Based on Towel Wash Room Method TO-15
G&K Services, Inc.

Compound	Shop Towel Test Towel Wash Room Concentrations (ppm) May 13, 2009	Print Towel Test Towel Wash Room Concentrations (ppm) May 14, 2009	OSHA PELs - TWA (ppm)
Ethanol	2.8	ND	1000
Acetone	0.93	3.3	1000
2-Propanol	0.31	1.8	400
2-Butanone	0.20	0.14	200
Methylene chloride	0.11	ND	25
n-Hexane	0.04	0.28	500
1,2-Dichloroethane	0.31	ND	50
n-Heptane	0.43	0.32	500
4-Methyl-2-pentanone	0.38	0.80	150
Toluene	0.83	2.90	200
n-Butyl acetate	ND	0.10	150
n-Octane	0.10	1.5	500
Tetrachloroethene	1.7	0.24	100
Ethylbenzene	0.22	3.0	100
m,p,o-Xylenes	0.86	9.5	100
Cumene	0.06	0.65	50
Trimethyl benzene (all isomers)	0.64	7.1	25*
Naphthalene	0.01	ND	10

Note: Trimethylbenzenes limit is based on ACGIH TLV limit as there is no OSHA PEL.

4.0 SAMPLING LOCATIONS

Emission tests were conducted at the following four locations at the Facility: (1) the dryer stack, which was accessed from the roof; (2) the temporary Towel Wash Room exhaust stack, which was accessed from the ground near the loading dock; (3) the hot water heater stack, which was also accessed from the roof; and (4) the temporary exhaust duct from the two EQ Tanks. EPA Method 2 traverse points were selected according to EPA Method 1 and 1A. EPA Method 25, 25A and TO-15 samples were collected from a point near the duct centers.

The primary source of ventilation air entered the Towel Wash Room enclosure through a partially open overhead door (natural draft opening-NDO) near the end of the building opposite to the location of the temporary fan. The enclosure was designed to draw outside air from the clean product room, across the sources in the main operations room, and out through a personnel door located adjacent to the loading dock at the back of the building. Figure 4-1 shows the locations of the ventilation air intake and exhaust points. Note that the dryer uses outside air drawn from an intake vent on the roof. Therefore, the dryer operation did not affect the Towel Wash Room enclosure air flow. The enclosure capture efficiency was monitored periodically using room static pressure measurements and NDO face velocity measurements.

The EQ Tank vents were connected together with 6-inch diameter flexible metal pipe and a metal tee. The other leg of the tee was connected to a 48-inch length of 6-inch metal pipe and a 600 cfm blower. The sampling ports were located 6 diameters downstream of the tee and 2 diameters upstream of the blower inlet. The air flow rate was approximately 100 cfm per EQ Tank.

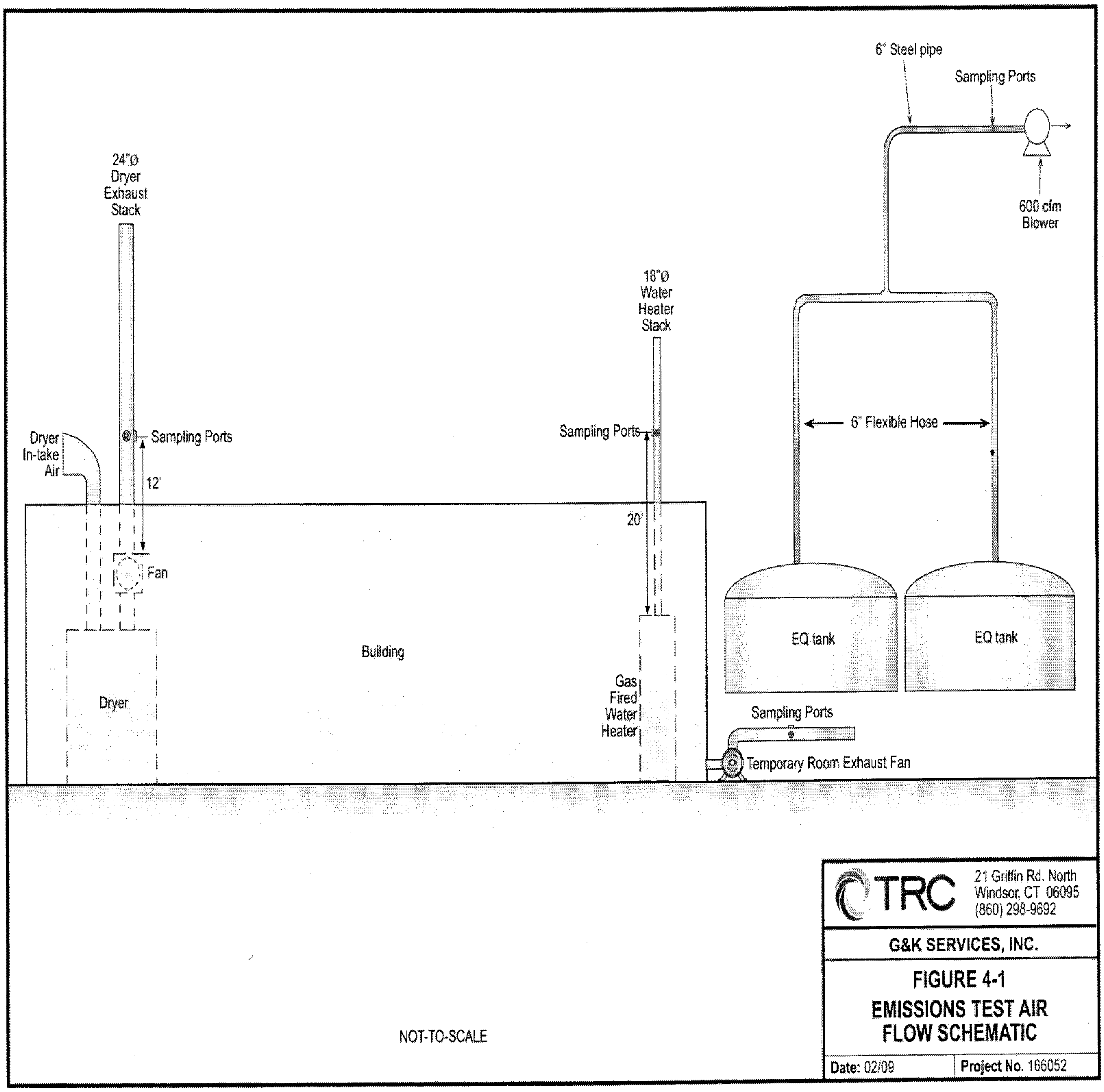


FIGURE 4-1
EMISSIONS TEST AIR FLOW SCHEMATIC

Date: 02/09 | **Project No.** 166052

5.0 SAMPLING AND ANALYTICAL PROCEDURES

5.1 EPA Methods 1, 2, 3, and 4 – Gas Flow Rate

Gas flow rate, O_2/CO_2 content, and moisture concentration were measured in accordance with EPA Methods 1, 2, 3A, and 4 at the combustion source vents (dryer stack and hot water heater stack). Gas flow rate and moisture concentration were measured at the non-combustion source vents (EQ Tanks and Towel Wash Room vents) in accordance with EPA Methods 1 and 2 and wet bulb/dry bulb temperature measurements.

Velocity traverses were conducted with calibrated S-type pitot assemblies in accordance with EPA Reference Methods 1 and 2. An S-type pitot tube and inclined manometer were used to measure gas velocity at multiple points selected in accordance with EPA Method 1 and a calibrated Type-K thermocouple and digital meter were used to measure the flue gas temperature.

A cyclonic flow check was conducted in accordance with EPA Method 1 using the nulling technique. An S-type pitot tube connected to an inclined manometer was used in this method. The pitot tube was positioned at each traverse point so that the face openings of the pitot tube were perpendicular to the stack cross-sectional plane. This position is called the "0° reference". The velocity pressure ("ΔP") measurement is noted. If the ΔP reading was not zero, the pitot tube was rotated clockwise or counter clockwise until the ΔP reading becomes zero. This angle was then measured with a leveled protractor and reported to the nearest degree. The average of the absolute value of the cyclonic angles was calculated and must be less than 20 degrees.

Tedlar bag samples or grab samples were collected and analyzed in accordance with EPA Method 3A for O_2 and CO_2 using a portable flue gas analyzer. Each sample was analyzed in triplicate. One sample was collected concurrently with each HAP emissions test run. Method 3A was not conducted on the temporary Towel Wash Room and EQ Tanks exhaust stacks as the composition there is 20.9% O_2.

Dryer stack and hot water heater stack moisture concentrations were measured periodically in accordance with EPA Method 4. Sample gas was pumped through a stainless steel probe, a Teflon sample line, a series of chilled impingers, and a dry gas meter. Sample gas moisture was condensed in the impingers and the condensate was quantified gravimetrically. The gas moisture content was calculated as a function of water collected in the impingers and volume of gas sampled. The Method 4 sampling train is shown in Figure 5-1. Method 4 tests were conducted on the dryer stack

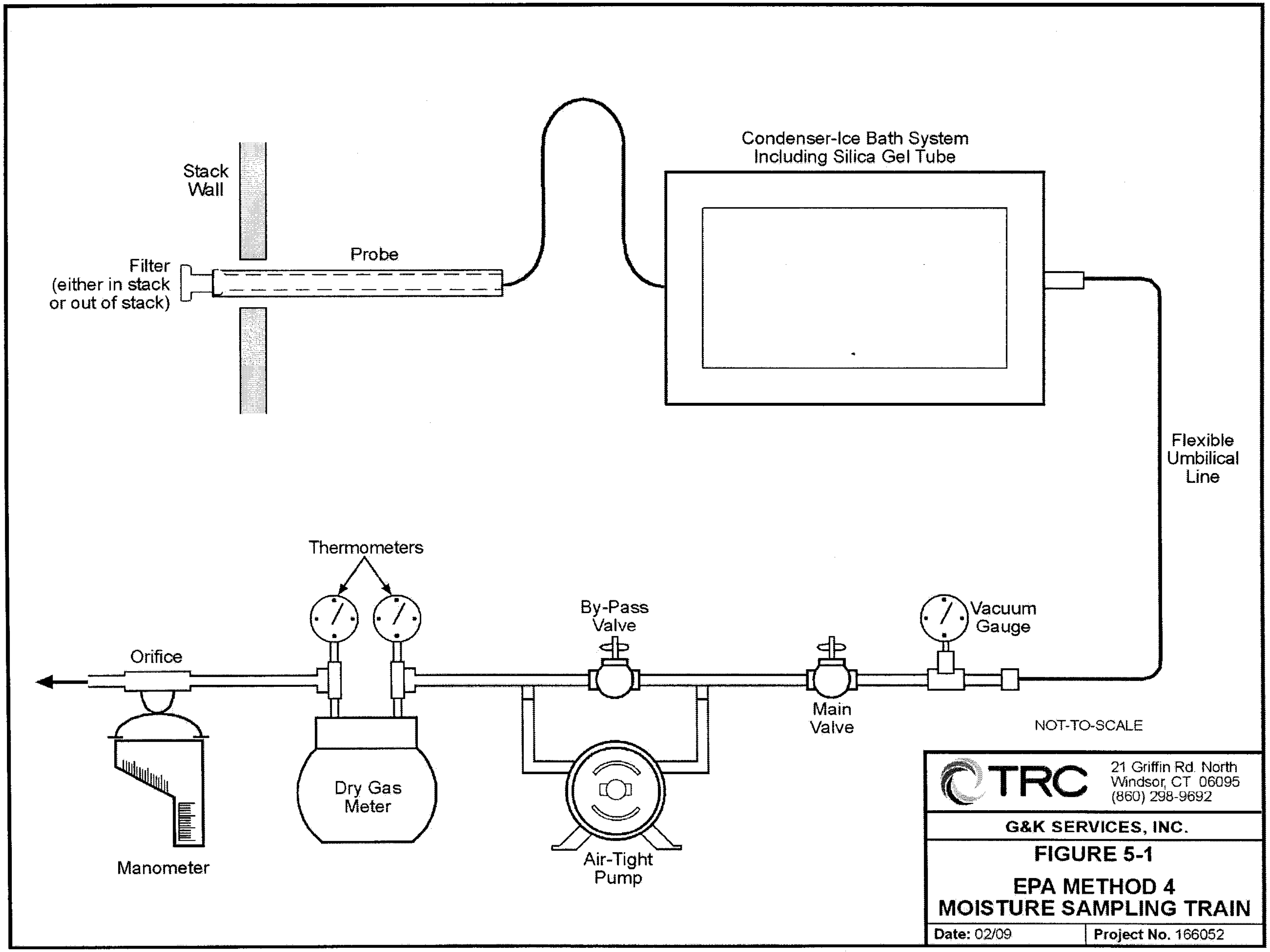


FIGURE 5-1

EPA METHOD 4 MOISTURE SAMPLING TRAIN

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concurrently with each 30-minute emissions test and on the hot water heater stack concurrently with each flow measurement.

The Towel Wash Room and EQ Tanks temporary vent moisture concentration were determined with wet bulb/dry bulb temperature measurements. Temperature measurements were conducted concurrently with each EPA Method 1 and 2 gas flow rate test.

5.2 EPA Method 25 – Total VOC Emissions

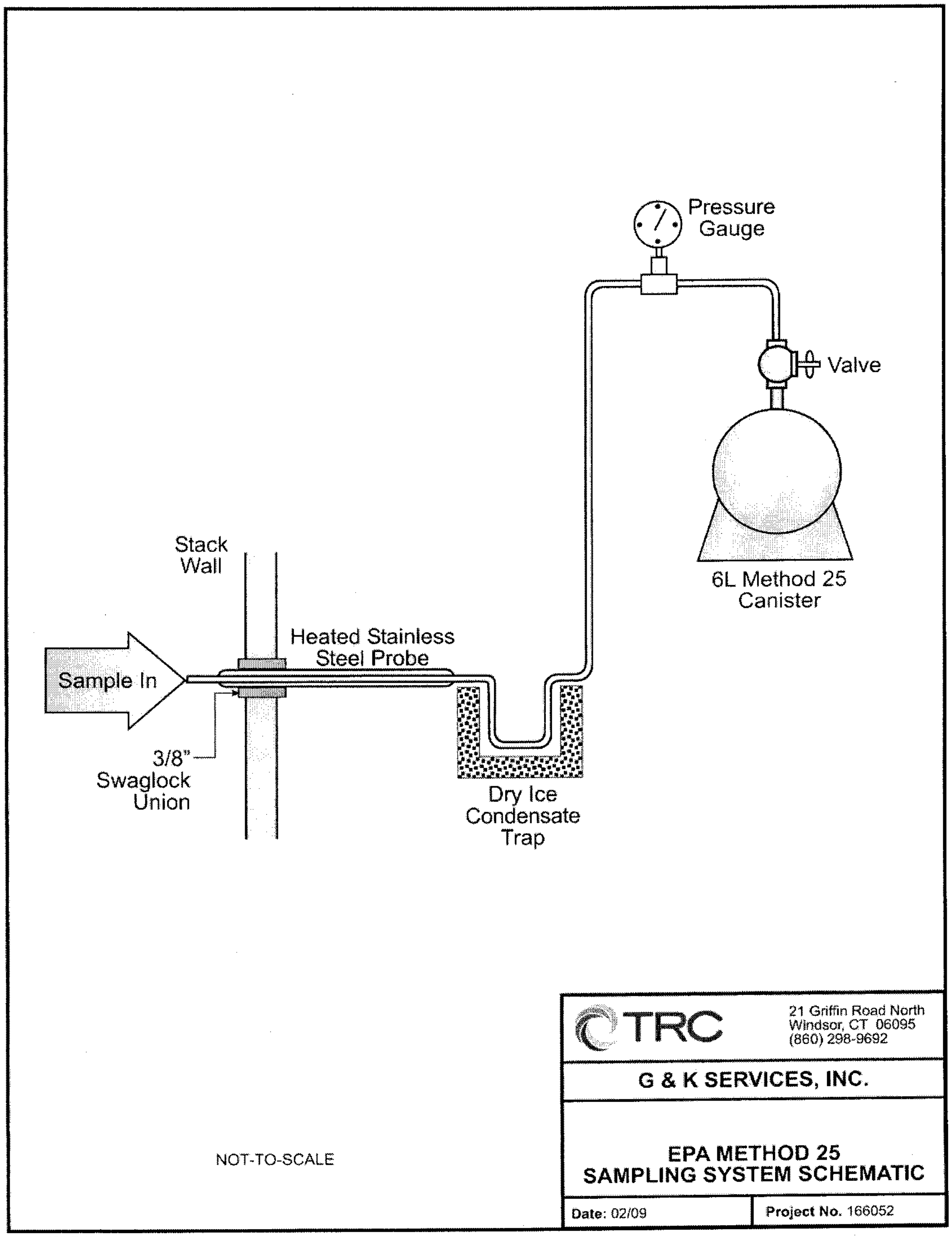
Method 25 uses a cold trap/evacuated canister sample and gas chromatography analysis to measure VOC as total gaseous non-methane organic ("TGNMO") emissions. Emissions are reported on an as carbon wet concentration basis.

5.2.1 Sample Collection

Triangle Environmental Service Inc. ("TES") provided Method 25 tanks, traps and analytical services. Tanks were leak checked prior to use by TES at its facility in Research Triangle Park, NC. Only leak tight canisters were employed during the testing. TES pressurized the tanks with helium before shipment to TRC. The canisters were evacuated on-site by TRC and tank vacuums were measured using a calibrated electronic manometer.

Prior to sampling, the following cleaning procedures were conducted to ensure that the condensate traps and sample tanks were suitably cleaned. The condensate traps were purged with hydrocarbon-free air at an elevated temperature (250°C) to remove any residual organics. Sample tanks were evacuated to 10 mm Hg and then refilled with hydrocarbon free air; this purge procedure was repeated three times. One blank trap and tank are submitted with the samples to verify the cleaning procedure.

The sampling train consisted of a heated stainless steel probe (265°F), heated filter (265°F), a condensate trap and an evacuated tank. The probe was placed at a representative point in the sampling location. The probe tip was placed away from the gas flow. The valve to the evacuated tank was opened and the gas stream flowed through the train at a constant rate. A rotameter was placed in line to regulate the flow of gas through the system. A schematic of this sampling system is presented in Figure 5-2. Dryer sampling was conducted at a constant rate of 90 milliliters per minute over a 60-minute



method 25C.Fh10

Figure 5-2

period (two dryer loads) to collect 3.6 liters of sample. Towel Wash Room air sampling and EQ Tank air sampling was conducted at 90 ml/minute over a 1-hour period. Sampling flow meter readings were recorded every 5 minutes during the test period.

A pre-test leak check was conducted by capping the end of the probe and switching the tank valve off. The sample train was evacuated to 10 mm Hg with a vacuum pump, and the purge valve to the pump was closed. The system was allowed to sit idle for 10 minutes, and the change in the vacuum was monitored. The leak rate is acceptable if it is less than one percent of the sampling rate. During each run, the condensate trap was immersed in dry ice.

At the conclusion of each run, the valve to the tank was shut off. The tank was disconnected from the train assembly, and was labeled with a sample tag. The condensate trap was removed from the train and both ends were immediately capped with Swagelok caps. The trap was then appropriately labeled with a sample tag. The trap was placed into a cooler of dry ice for shipment to TES in Research Triangle Park, NC.

5.2.2 Calibration

A propane calibration gas mixture was injected via a 1-mL sampling loop into the analyzer. The injections were repeated until three integrated areas indicate reasonable agreement. A 1.00% CO_2 standard was run daily with the same requirement. The average daily response factors must agree within 5% of the RF (CO_2) and the RF (NMO) from the initial performance check. Daily performance checks were performed at the beginning of each work day. Calibrations were performed daily or between different client sets of samples, whichever came first. Additionally, a system background check was performed between each set of samples. Duplicate injections of 1.0% CO_2 are made after the final sample each day. Response factors (average integrated area/concentration in ppmC) are calculated daily from the initial triplicate injections.

5.2.3 Analysis

Each trap was stored on dry ice prior to analysis and was flushed of CO_2 by passing zero air through the trap at -78°C through the CO_2 NDIR analyzer to the sample tank. CO_2 flushing was continued until the NDIR response is zero. The trap was then baked at 200°C with zero air flushing through the oxidation catalyst and the NDIR analyzer into the trap collection vessel. Collection was continued until the NDIR response was zero. The trap was transferred to an oven set at 350°C and baking was continued for 30 minutes to clean the trap for a subsequent sampling. The trap was taken out of the oven and allowed to cool, then capped and stored for shipment.

The sample tank was analyzed by injecting an aliquot via a 1-mL sample loop into the GC column, which is held at 85 °C to elute CO, CH_4, and CO_2 which pass to the oxidation catalyst, the reduction catalyst, and flame ionization detector ("FID"). The column was then backflushed at 195 °C to elute the organic fraction. The trap collection vessel was analyzed identically. In both cases, triplicate injections were made. The sample tank was pumped for 5 minutes (to less then 5 mmHg) and air was then allowed in via a paper fiber filter; this procedure was repeated. The tank was pumped 5 minutes and allowed to stand overnight. The tank was then connected to a pressure gauge to test for leaks (maximum permissible lead rate = 10 mmHg/day). If the tank passed the leak test, it was filled with helium to slightly greater than atmospheric pressure and stored for shipment.

5.3 EPA Method 25A – Total Hydrocarbon Continuous Monitoring

Total hydrocarbons were continuously monitored at the dryer stack, the temporary Towel Wash Room exhaust stack, the EQ Tanks vent, and the hot water heater stack in accordance with EPA Method 25A. In addition, methane concentrations were measured on the combustion sources in accordance with EPA Method 18. Because the methane concentrations were relatively small (i.e., approximately 8 to 13 ppm) and as a conservative measure of estimating VOC, methane was not subtracted from the Method 25A total hydrocarbon concentrations to report VOC emissions as non-methane VOC.

5.3.1 Sample Collection

Each sampling train consisted of a stainless steel probe, heated Teflon sample line, and a California Analytical Instruments, Inc. Model 300 heated FID total hydrocarbon analyzer ("California Model 300 FID"). A schematic of this sampling system is presented in Figure 5-3. The California Model 300 FID is a heated hydrocarbon analyzer, which detects concentrations of VOC in a sample stream by burning them in a hydrogen flame. The burner tip is positioned between two highly charged (approximately 300 VDC) plates. Ions are produced from the combustion of the VOC in the gas stream and create a current through migration of the ions between the highly charged plates. The current created is directly proportional to the concentration of hydrocarbons present in the gas stream. A computer-based data acquisition system was used to record data. The data

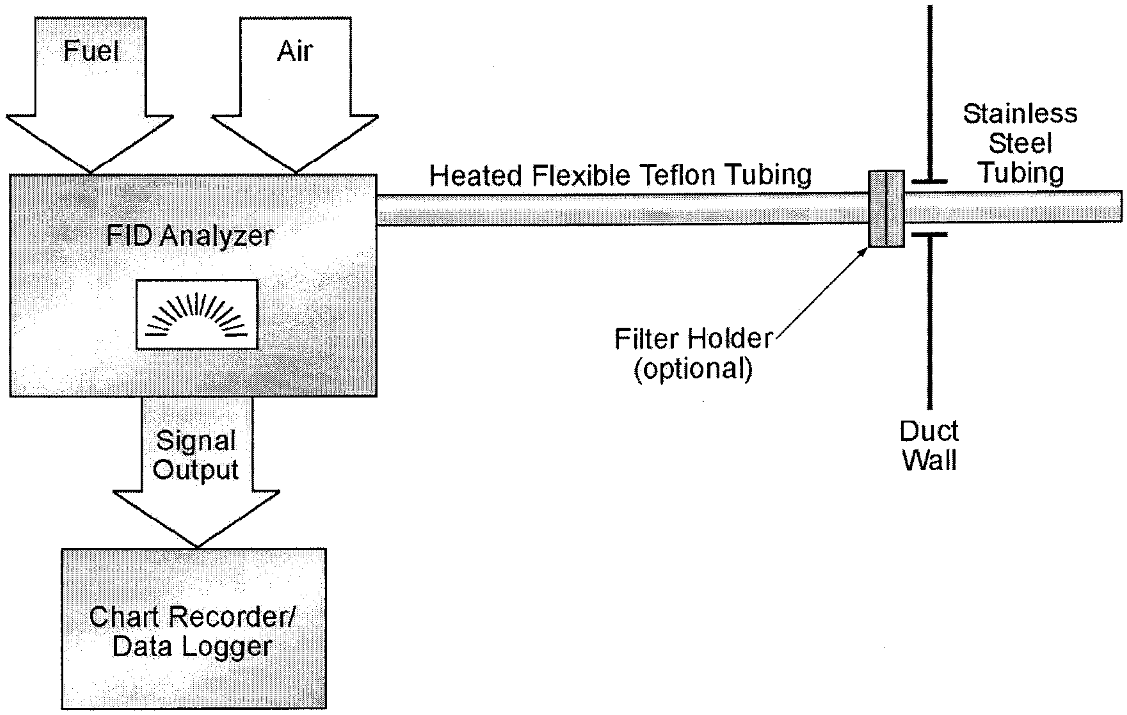


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FIGURE 5-3

FLAME IONIZATION DETECTION SAMPLING SYSTEM EPA METHOD 25A

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acquisition system was programmed to record 1-minute averages. Calibrations (zero and span) were performed using certified methane in air calibration gases at the beginning and end of each test period. Multi-point calibrations (zero, mid and span) were performed prior to the program to demonstrate linearity. A calibration gas table is presented below.

Table 5-1 Calibration Gas Table

Sampling location	Range	Zero	Low point	Mid point	Span
Dryer	0-10,000 ppm	Hydrocarbon free air	25-35%	45-55%	80-90%
Hot Water Heater	**0-1000 ppm or 0-5000 ppm**	Hydrocarbon free air	25-35%	45-55%	80-90%
EQ Tanks	**0-1000 ppm or 0-5000 ppm**	Hydrocarbon free air	25-35%	45-55%	80-90%
Towel Wash Room Temporary Exhaust	**0-1000 ppm or 0-5000 ppm**	Hydrocarbon free air	25-35%	45-55%	80-90%

Note: Calibration gas levels are listed as a percentage of the range.

5.4 EPA Method TO-15 Emission Concentrations

Pollutant emission concentrations were measured at the dryer stack, the EQ Tank temporary exhaust duct, and the Towel Wash Room temporary exhaust stack in accordance with EPA Method TO-15. Samples were collected in 6 liter passivated stainless steel canisters. The sampling system consisted of a stainless steel probe, mass flow controller, vacuum gauge, valve, and canister. The sampling system is shown in Figure 5-4. The canisters were evacuated to an absolute pressure of less than 0.5 in Hg prior to sampling. The mass flow controller was a diaphragm-type where the diaphragm increases the opening as the differential pressure decreases to maintain a constant sampling rate. The sample flow rate was checked prior to sampling with a primary standard gas flow calibrator. The canister pressure was checked and recorded at the beginning and end of each sampling period.

The TO-15 sampling procedure was modified on the dryer stack to eliminate moisture condensation and the potential loss of water soluble organics. The stainless steel probe, flow controller, and valve were heated to approximately 120°F to prevent condensation prior to the canister. In addition, the sampling flow rate was designed to maintain the canister at a pressure low enough to prevent condensation at the completion of sampling. The canister pressure was approximately 0.5 in Hg at the start of a test and 15 in Hg at the completion of a 60-minute test. The

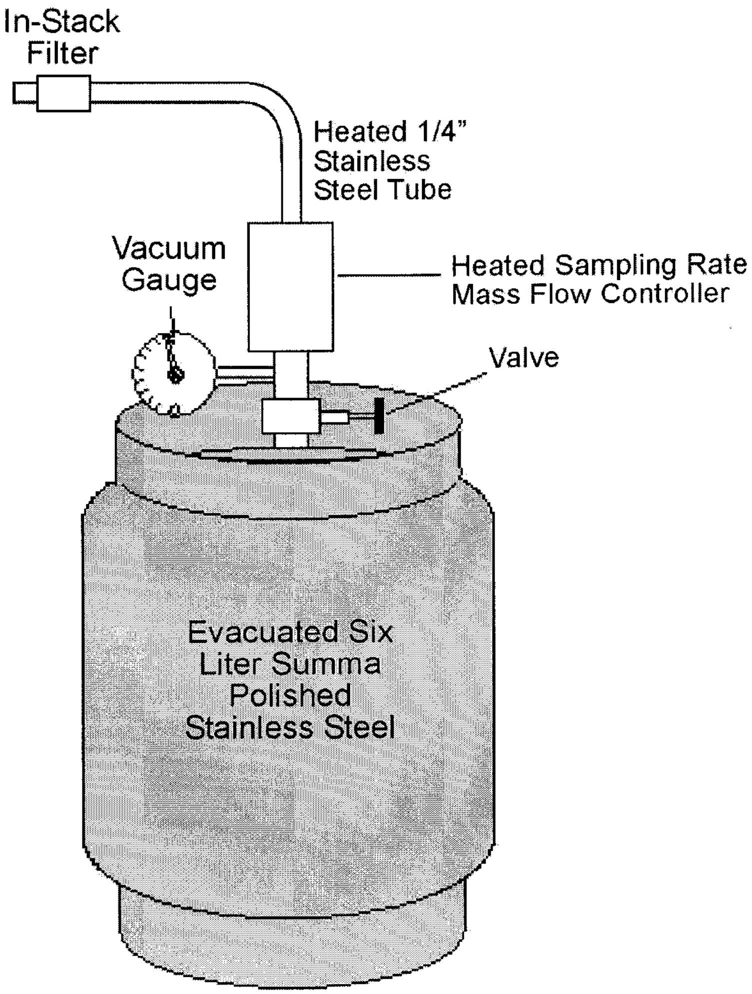

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FIGURE 5-4
EPA METHOD T0-15
SAMPLING TRAIN SCHEMATIC

Date: 02/09 | **Project No.** 166052 sample flow rate was approximately 75 cc/minute for a 3 liter sample volume. The canister pressure at the end of the test prevented condensation up to a concentration of 9.2% moisture at 68°F.

The TO-15 samples at the temporary EQ Tank duct and the temporary Towel Wash Room exhaust stack were operated without the heated components. The sample flow rate was approximately 10 cc/minute. The sampling duration was approximately 8 hours for a sample volume of 4.8 liters.

Analysis was conducted with temperature-programmed gas chromatography/low-resolution mass spectrometry by Columbia Analytical, Inc. The concentrations of HAPs and RTAPs were calculated using the internal standard technique. The samples were analyzed for the target compounds presented in Table 5-1.

5.5 EPA Method 204 – Towel Wash Room Enclosure Design and Capture Efficiency Determination

The temporary Towel Wash Room exhaust fan was designed for 5,000 cfm at a static pressure of 0.05 inches w.c. The total volume of the laundry room and adjacent clean product room is 138,000 cubic feet. The temporary fan was located at a personnel door near the loading dock at the east side of the building. The enclosure had a single natural draft opening ("NDO") which was located at the personnel door on the south side of the clean product room. Exhaust air was sweep through the clean product room, into the laundry room at the product bagging station, through the laundry room and out of the building at the far side of the laundry room. The NDO dimensions were adjusted with plywood for a total open area of approximately 10 ft^2 which provided a theoretical face velocity of 500 feet per minute ("fpm") or a building differential pressure of -0.0175 inches w.c.

The exhaust fan was equipped with an 18-inch diameter sheet metal pipe connected to the positive side. The overall length of the pipe was 180 inches (5 sections of 36-inch lengths). Sampling ports were located 144 inches (8 diameters) downstream of the fan exit and 36 inches (2 diameters) upstream of the pipe exit.

The permanent enclosure capture efficiency was demonstrated in accordance with EPA Method 204. Method 204 criteria include physical dimensions and minimum air velocity at enclosure openings. If the criteria are met, the enclosure capture efficiency is qualified as 100 percent. The building enclosure is shown in Figure 5-5 and the following parameters were verified during the capture efficiency test:

Table 5-2 EPA Method TO-15 Target Compound List

Compound	ppbv MRL
Propene	0.29
Dichlorodifluoromethane (CFC 12)	0.10
Chloromethane	0.24
1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	0.072
Vinyl Chloride	0.20
1,3-Butadiene	0.23
Bromomethane	0.13
Chloroethane	0.19
Ethanol	2.7
Acetonitrile	0.30
Acrolein	0.22
Acetone	2.1
Trichlorofluoromethane	0.089
2-Propanol (Isopropyl Alcohol)	0.20
Acrylonitrile	0.23
1,1-Dichloroethene	0.13
Methylene Chloride	0.14
3-Chloro-1-propene (Allyl Chloride)	0.16
Trichlorotrifluoroethane	0.065
Carbon Disulfide	0.16
trans-1,2-Dichloroethene	0.13
1,1-Dichloroethane	0.12
Methyl tert-Butyl Ether	0.14
Vinyl Acetate	1.4
2-Butanone (MEK)	0.17
cis-1,2-Dichloroethene	0.13
Ethyl Acetate	0.14
n-Hexane	0.14
Chloroform	0.10
Tetrahydrofuran (THF)	0.17
1,2-Dichloroethane	0.12
1,1,1-Trichloroethane	0.092
Benzene	0.16
Carbon Tetrachloride	0.080
Cyclohexane	0.15
1,2-Dichloropropane	0.11
Bromodichloromethane	0.075

Compound	ppbv MRL
Trichloroethene	0.093
1,4-Dioxane	0.14
Methyl Methacrylate	0.12
n-Heptane	0.12
cis-1,3-Dichloropropene	0.11
4-Methyl-2-pentanone	0.12
trans-1,3-Dichloropropene	0.11
1,1,2-Trichloroethane	0.092
Toluene	0.13
2-Hexanone	0.12
Dibromochloromethane	0.059
1,2-Dibromoethane	0.065
n-Butyl Acetate	0.11
n-Octane	0.11
Tetrachloroethene	0.074
Chlorobenzene	0.11
Ethylbenzene	0.12
m,p-Xylenes	0.23
Bromoform	0.048
Styrene	0.12
o-Xylene	0.12
n-Nonane	0.095
1,1,2,2-Tetrachloroethane	0.073
Cumene	0.10
alpha-Pinene	0.090
n-Propylbenzene	0.10
4-Ethyltoluene	0.10
1,3,5-Trimethylbenzene	0.10
1,2,4-Trimethylbenzene	0.10
Benzyl Chloride	0.097
1,3-Dichlorobenzene	0.083
1,4-Dichlorobenzene	0.083
1,2-Dichlorobenzene	0.083
d-Limonene	0.090
1,2-Dibromo-3-chloropropane	0.052
1,2,4-Trichlorobenzene	0.067
Naphthalene	0.095
Hexachlorobutadiene	0.047

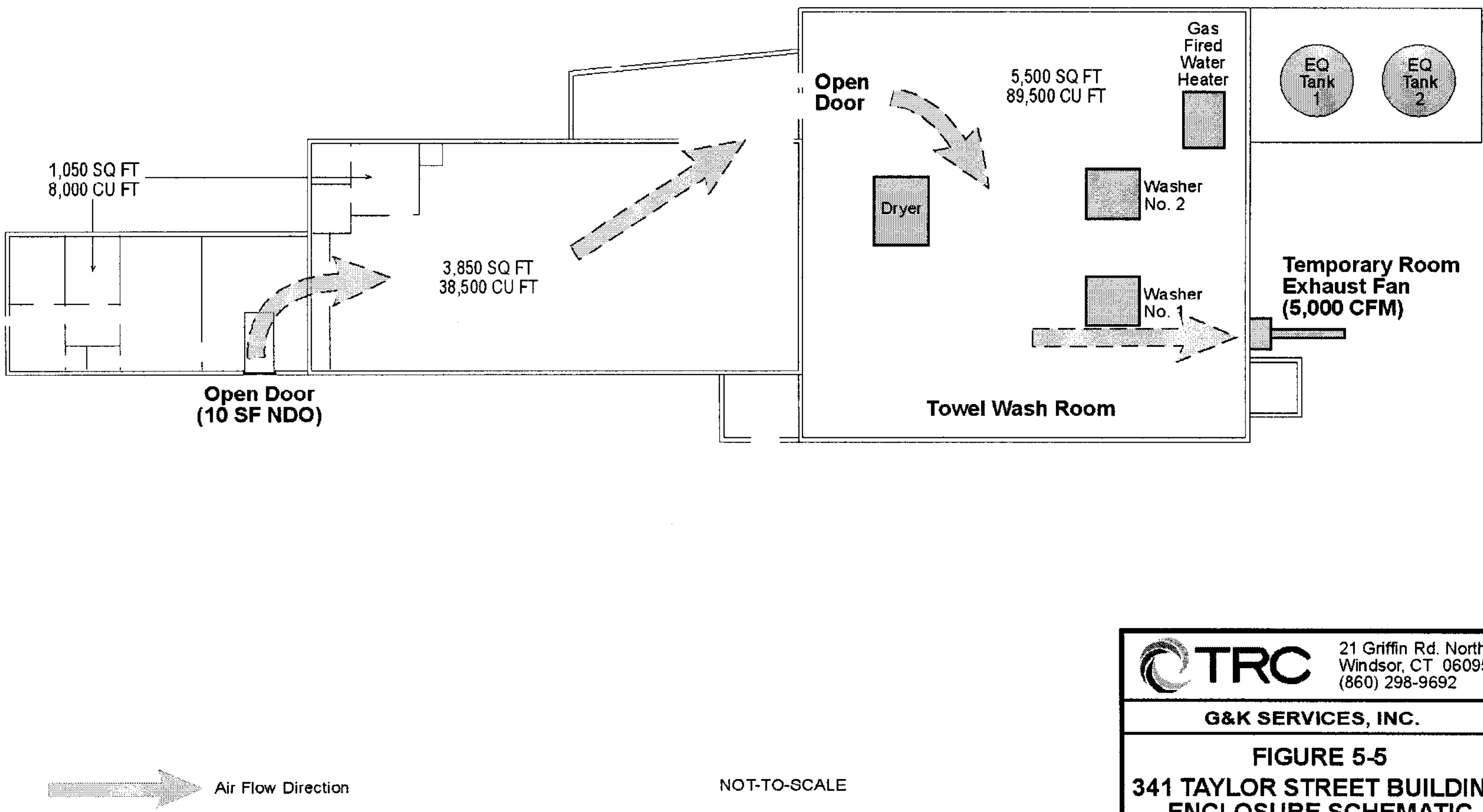

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FIGURE 5-5
341 TAYLOR STREET BUILDING ENCLOSURE SCHEMATIC

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1. Any NDO was at least 4 equivalent opening diameters from the VOC emitting point. Equivalent diameter for rectangular openings is calculated as follows: $D_e = 2(L)(W) \div (L+W)$.
2. Any exhaust point from the enclosure was at least four equivalent diameters from each NDO.
3. The total area of all NDOs did exceed 5 percent of the surface area of the enclosure walls, floor and ceiling.
4. The average face velocity at all enclosure NDOs was at least 200 fpm and the direction of the airflow was into the enclosure. Alternatively, the pressure drop across the enclosure was greater than 0.007 inches w.c.
5. All access doors, windows and hood latches which were not identified as NDOs were closed during normal operation.

5.6 Process Data

The following process data was recorded along with the instrumentation used to measure and record the data.

- Daily production (soiled weight) – weigh scales measure the load; the load weight is manually entered into the Dober data system
- Water temperature to washers –an Resistance Temperature Detector (RTD) thermocouple measures the temperature, which is directly connected to the Dober data system
- Water use – a water flow meter measures the flow, which is directly connected to the Dober data system
- Natural gas use – natural gas meter measures the flow, which is directly connected to the Dober data system
- Volume of wastewater discharged – discharge flow meter measures the flow; the data are manually logged
- Number and type of washer loads processed – the number of washer loads is manually entered into the Dober system
- Dry product weight per day – weigh scales measure the dry load weight; the load weight is manually logged.

6.0 QA/QC ACTIVITIES

6.1 QC Procedures

TRC's quality assurance program for source emission measurement is designed so that the work is performed by competent, experienced individuals using properly calibrated equipment and approved procedures for sample collection, recovery and analyses with proper documentation. The Program Manager, Project Manager and the Program Quality Assurance Manager were responsible for developing data of the highest quality. The Program Quality Assurance Manager was responsible for performing the accuracy and precision evaluations and the quality control reporting. Specific details of TRC's quality assurance program may be found in EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III (EPA-600/4-94-0271b).

Sampling and measurement equipment, including continuous analyzers, recorders, pitot tubes, dry meters, orifice meters, thermocouples, probes, nozzles, and any other pertinent apparatus, are uniquely identified, undergo preventive maintenance, and are calibrated before and after each field effort following written procedures and acceptance criteria. Calibrations are performed with standards traceable to the National Institute for Science and Technology ("NIST"). These standards include wet test meters, standard pitot tubes, and NIST Standard Reference Materials. Records of all calibration data are maintained in TRC's files. Copies of calibration data pertinent to this program are presented in Appendix G.

During field tests, sampling performance and progress were continually evaluated, and deviations from sampling method criteria were reported to the Field Team Leader who then determined the validity of the test run. All field data were recorded on prepared data sheets. Field Team Leaders maintained a written log describing the events of each day. Field samples, including field blanks, were transported from the field in shockproof, secure containers. Sample integrity was controlled through the use of prepared data sheets, positive sample identification, and chain-of-custody forms.

All calculations were performed using Excel spreadsheets developed by TRC. Final results were checked by a senior-level project engineer. The following discussions present the TRC quality control procedures for each of the proposed test methods.

6.1.1 EPA Methods 2, 3 and 4

The Method 4 sampling train was leak checked before and after each test run and the acceptance criteria was a leak rate of less than 0.02 cfm. The minimum Method 4 sample volume for the Dryer stack was 21 dscf. The minimum Method 4 sample volume was not applied to the hot water heater due to its intermittent and short durations of operation. During sampling, all pertinent test data were recorded on prepared data sheets at 5 minute intervals. The Method 4 dry gas meters were calibrated annually at multiple flow rates and after each field use at a single flow rate using the EPA Method 5 calibrated orifice procedure. Impinger trains were weighed before and after each test with a calibrated electronic balance.

Method 2 pitot tubes and thermocouples were calibrated prior to field use and inspected after the tests were completed. Pitot tube leak checks were conducted at the conclusion of each test.

6.1.2 EPA Methods 25 and TO-15

EPA Methods 25 and TO-15 sampling trains were cleaned according to the respective methods prior to field use. Field QA included leak checking prior to sampling. Both methods have specified calibration procedures for the sample analyses that were followed.

6.2 QA Criteria

Table 6-1 presents the QA criteria for EPA Methods 25 and TO-15.

Table 6-1 EPA Methods 25 and TO-15 QA Criteria

	Description	Criteria
EPA 25	Pre-test allowable leak rate (pressure change in cmHg over 10 minutes)	**1.5 cmHg**
EPA 25	Pre-test allowable leak rate (pressure change in cmHg over 10 minutes) – 4-hour samples	0.2 cmHg
TO-15	Initial Calibration for each target compound	<30% RSD
TO-15	Laboratory Blank (Internal standard deviation)	+/- 40%
TO-15	Daily Calibration	+/- 30%

6.3 Data Reduction QA Checks

The Test Coordinator performed an independent check (using a validated computer program) of the calculations with predetermined data before the field test to ensure that the calculations were correct. After field effort completion, the program manager and the final reviewer checked the data entry and final calculations.

7.0 CONCLUSION

G&K completed emissions testing at its Manchester Facility on May 13, 2009 (shop towels) and on May 14, 2009 (print towels) pursuant to the EPA-approved test protocol and on-site modifications. The test results confirm that the emissions from the Facility are less than US EPA major source thresholds, i.e., less than 50 tons per year of VOCs, 10 tons per year of a single HAP, and 25 tons per year of combined HAPs. The test results also indicated that actual VOC emissions for the towel plant are greater than the 10 tons per year threshold under the State of New Hampshire's applicable air regulations. Accordingly, G&K is submitting to the NHDES a State air quality permit application with corresponding air permit fees concurrent with the submission of this test report.